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ABSTRACT

Environmental education issues and programs in Asian and Pacific countries are examined in four sections. Section One presents a general overview of environmental education in the region. Topics discussed include environmental problems, goals and objectives for environmental education, legislation, the nature of environmental education, curriculum and instructional materials, teaching strategies, teacher education, and evaluation. Papers in Section Two were first presented to a Regional Workshop on Environmental Education convened by Unesco in Bangkok, Thailand. They describe the status of environmental education in 17 different countries and vary greatly in scope, often focusing on one or more of the above topics. Section Three addresses common problems and various dimensions of environmental education. Articles on population, the role of science, mass media, industrialization, and specific programs indicate that although environmental education is of relatively recent origin in countries around the world, much is being done in most countries in the region. The final section contains an extensive bibliography. (Author/DC)

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BULLETIN
of the Unesco Regional Office
for Education in Asia and the Pacific

Number 22 June 1981

Environmental Education in Asia and the Pacific

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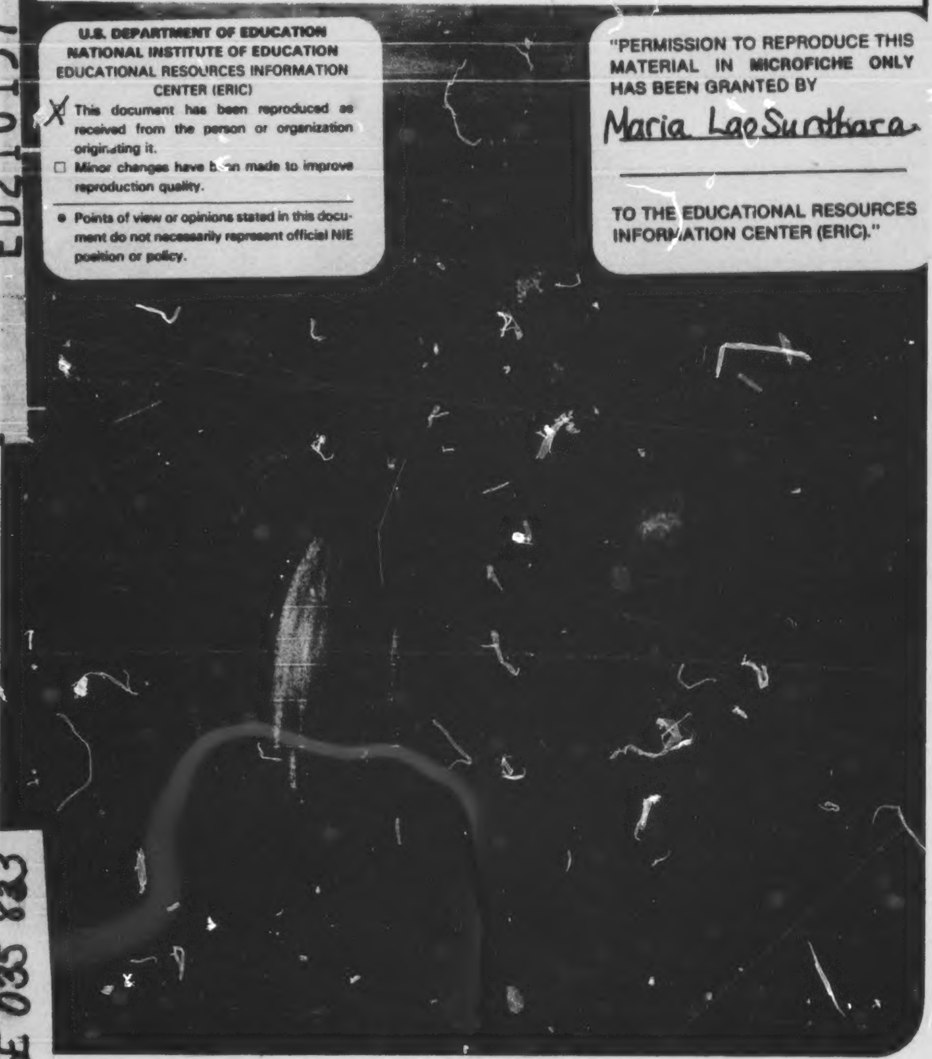

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Unesco, Bangkok

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The earth does not belong to man;
man belongs to the earth.

—North American Indian Chief Seattle, 1854

BULLETIN
of the Unesco Regional Office for Education in Asia and the Pacific

Number 22 June 1981

ENVIRONMENTAL EDUCATION IN ASIA AND THE PACIFIC

> *"Viewed from the distance of the moon, the astonishing thing about the earth, catching the breath, is that it is alive. The photographs show the dry, pounded surface of the moon in the foreground, dead as an old bone. Aloft, floating free beneath the moist, gleaming membrane of bright blue sky, is the rising earth, the only exuberant thing in this part of the cosmos."*
>
> —Lewis Thomas
> in *The Lives of a Cell*

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BANGKOK

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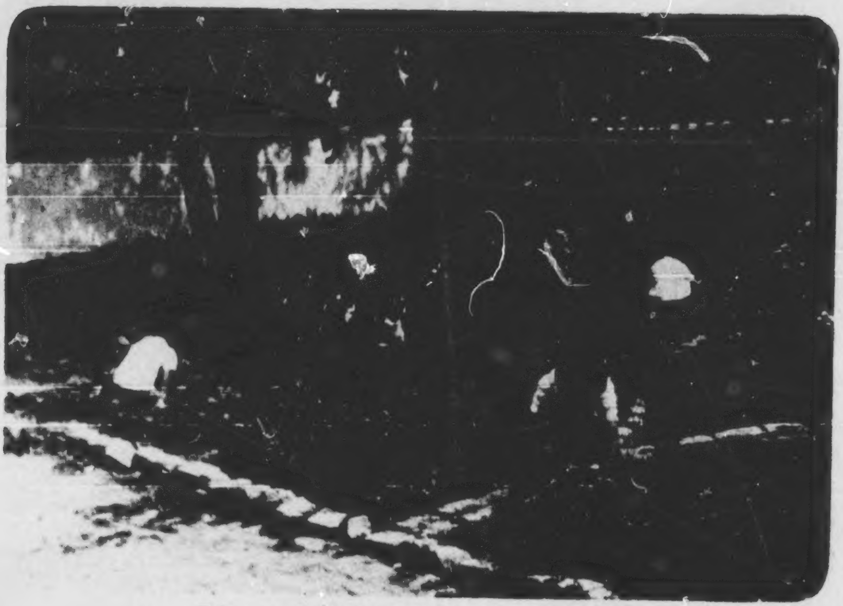
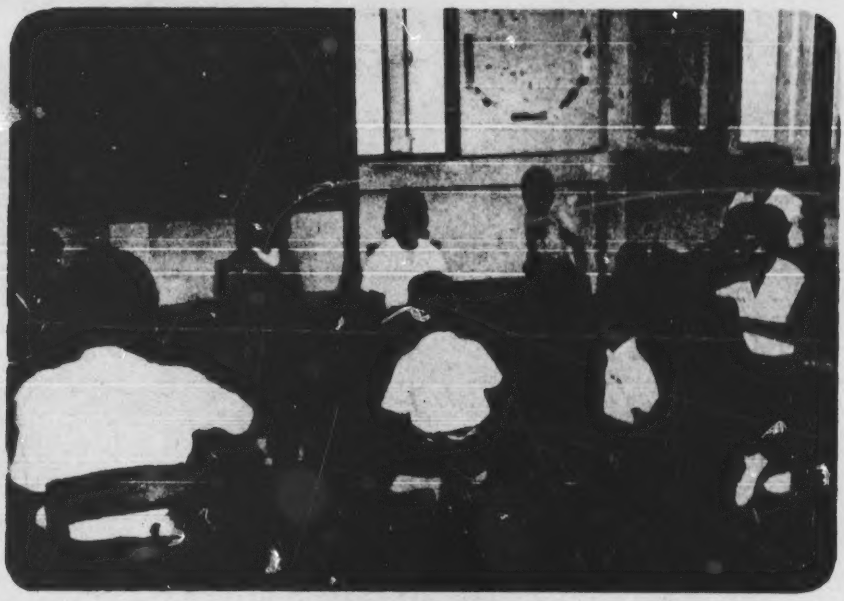


Primary school girls enjoying school gardening...

While the boys seem to be talking it over



Pupils playing the roles of their elders in the community

Pupils using land near the school to grow vegetables with water from the pond

These pictures have been chosen from the article on Thailand's Life experiences Programme. Full-colour reproduction has been donated to the cause of environmental education by Craftsman Press, Bangkok.

PREFACE

This Bulletin reproduces articles adapted from country reports presented to a workshop held in Bangkok, followed by special articles obtained from writers in the region of Asia and the Pacific. The articles, being written according to the viewpoint of the particular author, show a high degree of variation in scope. It is hoped, therefore, that the Bulletin will serve curriculum planners as a functional sourcebook for environmental education. For this purpose, we list here the characteristics of each article in Section Two so that the reader may use it as a reference. The special articles in Section Three speak for themselves.

Introduction	background information and goals and objectives;
Afghanistan	a brief overview and a pilot project;
Australia	strategies, teacher education, classification and listing of concepts;
Bangladesh	environmental problems, issues and actions;
China	environmental policy, a pilot programme in environmental science, some environmental education experiments, recommendations;
India	definitions, objective, curricular topics, teaching materials;
Indonesia	analysis, a detailed concept sequence and topics of learning materials;
Iran	effects of modernization and migration on people, drug addiction;
Japan	major problems, lesson topics in elementary and secondary schools;
Malaysia	major actions, curriculum development group activities, teacher training;
Nepal	large-scale problems, legislative sanctions, education at three levels;
New Zealand	issues, curriculum development, concept map and a graphic outline, teacher education;
Philippines	issues and actions, objectives, detailed learning sequences, examples of learning activities;

Republic of Korea : issues, a national Charter for the Preservation of Nature, curriculum development and implementation;

Singapore : major problems and issues, national campaigns, non-formal education, teacher training;

Sri Lanka : legislative acts, issues and actions, curriculum, out-of-school activities;

Thailand : issues, curricular contents for grades I–IX, project for a national source book;

Union of Soviet Socialist Republics : trends in environmental education, curricular content and field practice, details of out-of-school and vocational, technical and specialized education.

Section Four, the Bibliographical Supplement, was prepared in a progressive manner, in that titles of documents very recently acquired were added to the list of those classified at an earlier date. More publications sent in from within the region will be welcomed by the Unesco Regional Office, Bangkok. □

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For the environment

this paper contains recycled material

SECTION ONE

ENVIRONMENTAL EDUCATION IN ASIA AND THE PACIFIC

We have not inherited the earth
from our fathers.
We have borrowed it
from our children.

United Nations Environment Programme Annual Review 1978

Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
Number 22, June 1981

SECTION ONE

ENVIRONMENTAL EDUCATION IN THE REGION

Introduction

This issue of the Bulletin brings together a series of articles on a theme of growing importance to Asia and the Pacific—the quality of the environment which sustains life. The articles in Section Two describe the status of environmental education in 17 countries of the region and were first contributed to a Regional Workshop on Environmental Education convened by Unesco in Bangkok in September 1980. The Articles in Section Three discuss some of the common problems in environmental education and various aspects of the subject. These contributions go to show that although environmental education is of relatively recent origin in countries around the world, much is being done in most countries in the region not only to identify the substantive matter that is to be used in the teaching/learning process but also possible strategies for its implementation in formal school programmes as well as in the out-of-school sector. In the words of Mr. Amadou-Mahtar M'Bow, Director-General of Unesco,

> *. . . In an area as new . . . as that of environmental education, clarification of the concepts and principles which should guide our action is of crucial importance. What must be done is to state as clearly as possible not only what is meant by environmental education, but . . . above all, its specific functions as part of the general effort to develop and bring about a renewal in education, in order to prepare each individual squarely to shoulder his responsibilities.*[1]

Why the deepening concern about environment?

The region of Asia and the Pacific contains four-fifths of the people in the world currently living on desertified land. Some 50 million people subsist on arid lands being degraded by soil erosion and the intrusion of sand and salt.

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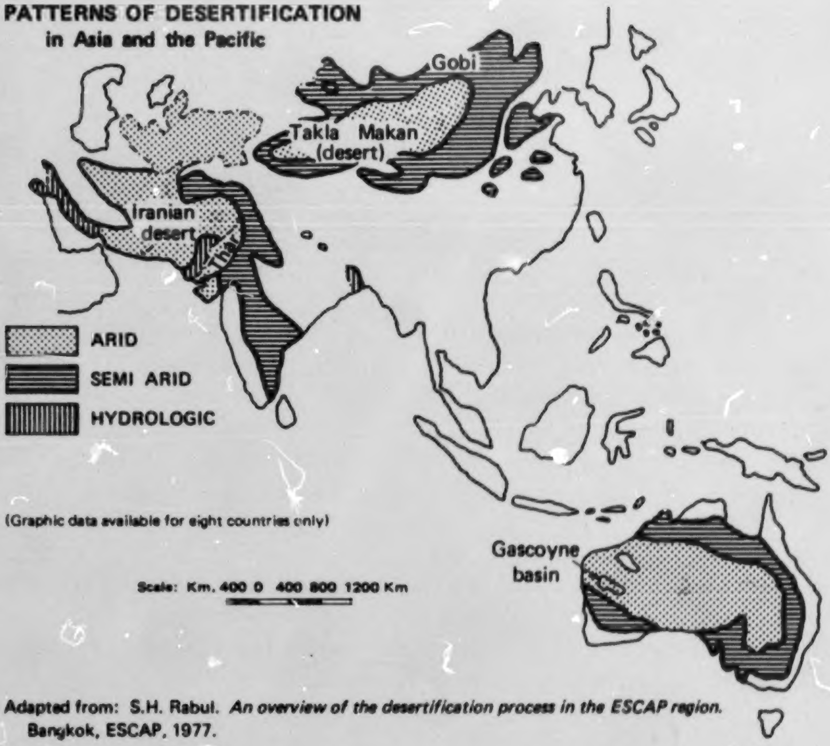
1. [Unesco/UNEP] Intergovernmental Conference on Environmental Education, Tbilisi, USSR, 14–26 October 1977. *Final report.* Paris, Unesco, 1978, p. 67.


PATTERNS OF DESERTIFICATION
in Asia and the Pacific
Gobi
Takla Makan
(desert)
Iranian
desert
Thar
ARID
SEMI ARID
HYDROLOGIC
(Graphic data available for eight countries only)
Scale: Km. 400 0 400 800 1200 Km
Gascoyne
basin

Adapted from: S.H. Rabul. *An overview of the desertification process in the ESCAP region.* Bangkok, ESCAP, 1977.

Considering that Asia and the Pacific region contains 15 per cent of the world's arid lands, and assuming conservatively that the rate of desertification in Asia and the Pacific is no more than the annual world average of 6 million hectares, it appears that close to a million hectares are being desertified each year.

Deforestation is another problem which is of grave concern since it can have an adverse effect on the world's climate and has critical implications for agriculture. Forested areas are disappearing in most parts of the region at the rate of two per cent per year and in some cases faster still, resulting in soil erosion and flooding.

Over the past generation, the Indian sub-continent has been progressively deforested; the soil's ability to absorb and hold water has diminished. More frequent and severe flooding has ensued. Deforestation has taken its greatest toll in the Himalayas and the surrounding foothills, where the subcontinent's major river systems—the Indus, the Ganges and the Brahmaputra—originate.

Satellite pictures of Java indicate that as little as 12 per cent of this formerly lush island now has tree cover. In the catchment areas of the Solo, Brontas and Citarum river systems, forest cover is well under 10 per cent. The silt load of the Citarum experienced a seven-fold increase over a recent three-year period, filling up Indonesia's largest river downstream at Jatiluhur.

Deforestation in the Philippines is very advanced, with the forest cover probably less than a fifth of the country's land area—a far cry from the 35–50 per cent commonly assumed. In northern Thailand, forests are being decimated at an estimated rate of 5–7 per cent a year. This deforestation rate and the estimate of a 2.3 per-cent annual rate of population growth[2] indicate future problems for Thailand: intensive, controlled irrigation will be needed just when upstream erosion and an irregular water flow will make downstream management exceedingly difficult, if not impossible.

Coupled with deforestation, countries in the region face another problem. Perhaps the least recognized facet of the world energy problem is the scarcity of firewood, the primary fuel for a third of mankind. The World Conservation Strategy informs us that at the present time 1,500 million people rely on firewood to cook with and to heat their homes.[3]

---

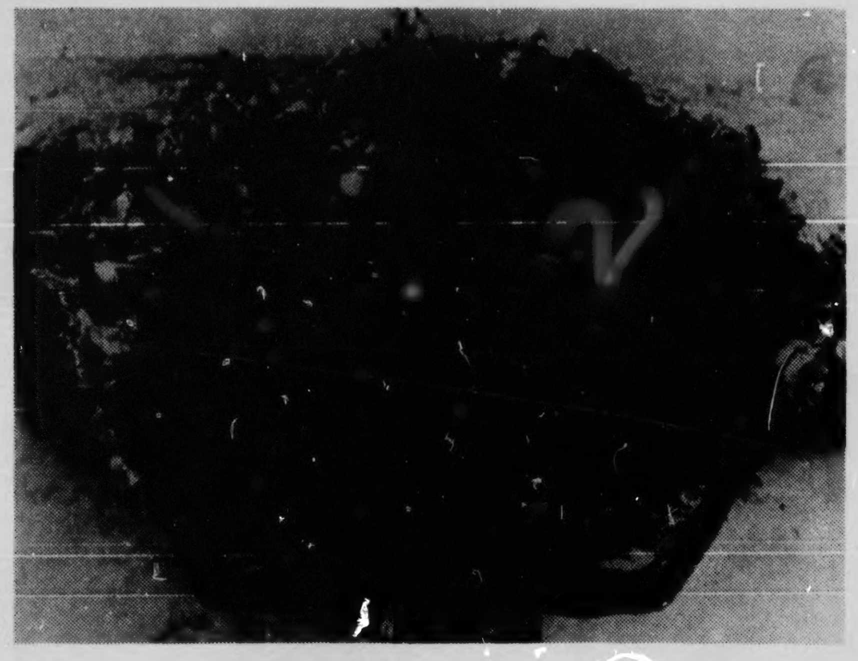
[2] *1980 world population data sheet.* Washington, D.C., Population Reference Bureau, 1980.

[3] "Keeping the stoves of the Third World burning," *IUCN Bulletin* 12(3–4) 1981.

Where have the forests gone? A school's firewood for a day or two (collected by teachers)

The uncontrolled and indiscriminate collection of firewood for cooking and heating can have serious implications. Today, swelling populations have progressively pushed back the forests that once surrounded villages in developing countries. In some areas, villagers spend a day or

An improvised clay stove. Nearly 95 per cent of households in rural areas in developing countries use firewood as a primary source of energy.



more collecting a bundle of wood or dried leaves and twigs. It is inevitable that as population growth continues, the 'poor man's energy crisis' will become even more acute.

In spite of optimistic assumptions about the spread of wood-conserving stoves and cooking alternatives like bio-gas plants and solar cookers, meeting the firewood needs of the world would require that 20-25 million hectares of new plantations be completed by the year 2000. At the current rate of planting trees, and bearing in mind that the annual loss of forests in Asia is about 5 million hectares, the new plantations would in 20 years amount to only two million hectares, just a tenth of what is actually needed for firewood alone.

Then, there are the consequences of the continuous exodus of people from rural to urban areas. Migration from the countryside to the cities is adding to the already serious problem of shortfalls in housing and public amenities. It is in areas where the pressure of dense populations is most evident that the physical quality of life has deteriorated most.

It has been estimated that only ten per cent of rural inhabitants in the region have access to water supplies that meet minimal health standards. In many large cities of Asia—where the population may double in

15 years—the limited availability of fresh water is undermining health and restricting food supplies. Accumulated, untreated wastes and agricultural chemicals are causing serious deterioration to ground water resources.

In most countries in the region, clean water is becoming a limited resource, threatening to slow down or block development efforts. The fragile Pacific island ground water systems are increasingly over-exploited and polluted, requiring the use of engineered exploitation of ground water and the development of alternate catchments such as galleries and tanks.

The problems and issues encountered in the countries of this region (and other regions) may be broadly classified according to scale as follows:

1. Macro-level problems which relate in any country to nationwide socio-economic development. Examples of these problems and issues relate to such wide areas as rural development; reforestation; electrification and dam construction; industrialization; urbanization and the establishment of new human settlements; social changes, especially those affecting disadvantaged populations; and exploration of natural resources, including the world energy problem.
2. Micro-level problems which relate to everyday living in rural and urban areas, both as a result of national socio-economic development programmes and projects and because of other factors;

examples of these problems and issues relate to such aspects as health and sanitation; social and family problems; changes in personal life and changes in cultural patterns.

The emergence of environmental education

Since 1970, there has been a growing effort and activity on the educational front devoted to environmental problems and to environmental education. The United Nations reflected the global nature of this awareness when, in 1972, it organized the first International Conference on the Human Environment in Stockholm, Sweden. The Conference revealed a widening interest in the environment and established the generality of environmental problems; it also exposed a lack of widespread experience in tackling the problems. Perhaps the most outstanding achievement of the Conference was the establishment of the United Nations Environment Programme (UNEP) which, together with Unesco, embarked upon an International Environment Education Programme in January 1975.[4]

In October 1975, this programme held an International Environmental Education Workshop in Belgrade, Yugoslavia. A major outcome of this Workshop was the Belgrade Charter. This Charter recognized the urgent need in environmental education to develop a global understanding or perspective of the ecological, economic and moral considerations. It also provided an excellent frame of reference for the task of designing environmental education programmes from the realities of an environmental situation.

Part A of the Charter is entitled Environmental Situation. Parts B, C and D are reproduced below. The contents of Parts E and F, on Audiences and Guiding Principles, respectively, are referred to in several articles of the Bulletin.

> **B. Environmental Goal**
>
> The goal of environmental action is:
>
> *To improve all ecological relationships, including the relationship of humanity with nature and people with each other.*
>
> There are, thus, two preliminary objectives:
>
> 1. For each nation, according to its culture, to clarify for itself the meaning of such basic concepts as "quality of life" and "human happiness" in the context of the total environment, with an extension of the clarification and appreciation to other cultures, beyond one's own national boundaries.

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[4] United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972. *Report.* New York, United Nations, 1973. 77 p.

2. To identify which actions will ensure the preservation and improvement of humanity's potentials and develop social and individual well-being in harmony with the biophysical and man-made environment.

C. Environmental Education Goal

The goal of environmental education is:

To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

D. Environmental Education Objectives

The objectives of environmental education are:

1. **Awareness:** *to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.*

2. **Knowledge:** *to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.*

3. **Attitude:** *to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.*

4. **Skills:** *to help individuals and social groups acquire the skills for solving environmental problems.*

5. **Evaluation ability:** *to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors.*

6. **Participation:** *to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.*[5]

* * *

---

[5] International Workshop on Environmental Education, Belgrade, Yugoslavia, 13-22 October 1975. *Final report.* Paris, Unesco, 1976. 60 p. (ED-76/WS/95)

The Belgrade Workshop was followed by a series of regional meetings of experts. The Asian regional meeting took place in Bangkok in 1976 and brought together representatives from a number of countries of the region to review and evaluate the Belgrade recommendations in the more specific regional context prior to a world conference at an inter-governmental level.[6]

The Inter-Governmental Conference on Environmental Education was held in Tbilisi, Georgia, USSR, in October 1977, and marked the culmination of the first three-year programme on environmental education. This Conference was aimed at a very high level of administrative and governmental decision-making. Its stated purpose was to arrive at recommendations for actions which might be undertaken at the national, regional and international levels. In the opening words of the Tbilisi Declaration,

> *In the last few decades, man has, through his power to transform his environment, wrought accelerated changes in the balance of nature. The result is frequent exposure of living species to dangers which may prove irreversible.*[7]

---

[6] Regional Meeting on Environmental Education for Asia, Bangkok, 15-20 November 1976. *Final report.* Bangkok, Environmental Education and Research Project, Mahidol University, 1976. 1 v. (various paging) mimeo.

[7] /Unesco/UNEP/ Intergovernmental Conference on Environmental Education, Tbilisi, USSR, 14-26 October 1977. *Final report.* Paris, Unesco, 1978, p. 67.

Environmental education in the region

The Conference formulated 41 recommendations of which 16 are on strategies for the development of environmental education at the national level. It will be fitting at this juncture to consider how the Specialized Agencies of the United Nations system in general, and Unesco in particular, are contributing to the improvement of the global environmental situation.

Within the United Nations system, many of the Specialized Agencies are directly concerned with environmental matters. The publication of their research results and of the proceedings of symposia, expert panels and working groups which they have sponsored over the past 30 years has played an important role in generating public awareness of environmental problems. Several United Nations agencies–particularly Unesco, the World Health Organization (WHO), the World Meteorological Organization (WMO), the International Labour Organisation (ILO) and the Food and Agriculture Organization of the United Nations (FAO)–have been conducting research, public information campaigns and formal and non-formal programmes of education and training in areas directly related to environmental education. Many of these activities are carried out with the assistance of UNEP. Interagency collaboration has made significant progress in the development of an overall framework and direction for a co-operative international programme in environmental education.

Within Unesco in particular, some environmental education efforts have been made from the Organization's early days. In the immediate past, efforts related to environmental education have been recorded in each sector with an increasing emphasis on inter-sectoral programming and activity.

Many of the programmes in the field of education have been directly involved in general environmental education; e.g., the programmes for Integrated Science, Biology, Education for International Understanding and Peace, and Population Education. Unesco's Man-and-the-Biosphere Programme (MAB), has made 'Perception of Environmental Quality' one of its key project areas.

In another joint programme with UNEP, environmental education for engineers of all disciplines has been initiated; similar programmes are being developed for architects, town-planners, managers and economists.

Environmental legislation at the national level

Since the Tbilisi Intergovernmental Conference on Environmental Education a number of developments have taken place which have brought into focus the various environmental dilemmas facing humankind as well as the possibilities now open to countries in the region to

solve them. Many countries have now responded to the challenges which confront them and have initiated corrective control measures.

Laws and acts related to environmental concerns exist in most countries in the region. The range of legislative actions is wide and refers to such widely dispersed situations as the prevention of pollution of various kinds; conservation and management of resources, including wildlife resources; improvement of working conditions and safety; sanitation and health; and preservation of the national heritage. The extent and detail of legislative actions vary among the Member States and among the specific areas of environmental concern.

A few countries have elaborated legislation in great detail to the extent of setting strict laws which subject those responsible for their infringement to severe penalties. At least five countries in the region have recognized environmental concerns in their national constitutions or policy documents.

In addition to laws and acts, various government organizations have sprung up in some countries to deal with environmental problems at the national level. For example, in at least six countries in the region, the government organizations have ministerial status. One country has even promoted it further to the Council of Ministers so that ministers could take collective responsibility.

A number of countries, seven at present, have set up special commissions or boards or agencies specifically for the protection and enhancement of the environment. These agencies, in most cases, have direct advisory access to the national or ministerial decision-making level and represent an increasingly powerful voice in national policy making.

In addition to government organizations, various private and voluntary organizations such as consumer associations or the international organizations—such as Friends of the Earth, and Action for World Development—are gaining adherents in the region. These private and voluntary organizations have one common aim—to protect, protest, conserve, publicize and agitate for the environment.

Environmental concern in most countries of the region is being institutionalized at the national level as increasingly large shares of their national budgets are being devoted to issues pertaining to the improvement of the quality of life of their people.

Development of environmental education

Since the early 1960s, there has been much discussion concerning the place of environmental education in the curriculum. In some cases, environmental education has been concentrated into a single subject such as Environmental Science, but more recently there has been some recognition that environmental education, as an emphasis, belongs in the existing curriculum in all subjects.

In some of the recent literature devoted to environmental education, the characteristics have been stated something like the following:

1. Environmental education should be *integrated* into the whole system of formal education at all levels;
2. Environmental education should be *interdisciplinary* in nature;
3. Environmental education should adopt a *holistic* perspective which will examine the ecological, social, cultural and other aspects of particular problems;
4. Environmental education should be centred on *practical problems* related to real life; and
5. Environmental education should aim at building up a sense of *values.*

The various curricular patterns for environmental education advocated most often include the following:

a) Single-subject approach : where components are drawn from a *single* academic discipline,

b) Interdisciplinary approach : where components are drawn from two or more academic disciplines and focused *simultaneously* on a single topic,

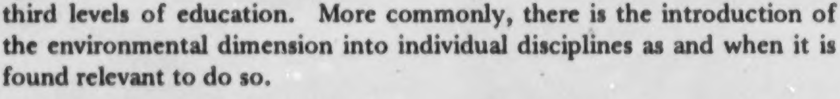
c) Multidisciplinary approach : where components are drawn from two or more academic disciplines and focused *sequentially* on a single topic,

d) Holistic approach : where there is co-ordination of separate courses such that the diverse fragments of knowledge and understanding are woven together.

Many countries in the region have attempted to achieve a measure of interdisciplinarity at the first level of education and in some aspects of out-of-school education. Interdisciplinarity at the second level, however, appears not to have met with the same degree of success as at the first and third levels of education. More commonly, there is the introduction of the environmental dimension into individual disciplines as and when it is found relevant to do so.

Holistic approaches, beyond a contribution of science and social studies, covering social, political, economic, cultural, natural and man-built aspects—even at the primary level where integration appears—are not yet common.

For non-formal education, however, a wide range of strategies have been reported in the Member States. Most of these relate to the infusion of environmental topics into existing educational programmes such as literacy and adult education and agricultural extension programmes. A wider outreach has been reported through a more extensive use of mass media of several kinds as well as through various national campaigns.



Preparation of curriculum and instructional materials

Advanced work in curriculum development in the science disciplines in the 1950s and early 1960s had resulted in the birth of dozens of curriculum packages in physics, chemistry, biology and integrated science.* In those days curriculum developers depended almost entirely on science researchers to provide the substantive data that was to be used in developing their curriculum materials. Fortunately, the scientific community of researchers was well ahead of the curriculum developers' demands for pure academic knowledge.

But the scenario appears to be reversed in the case of environmental education where the curriculum developers' demands seem to be ahead of what researchers have to offer since the emphasis of the latter's research activities has not been specifically geared to the solution of real environmental problems within each country. This means that the knowledge base for classroom environmental education has to be reinforced in order to provide a working knowledge of the human eco-system.

Hence there is an urgent need to train researchers to adopt, in their research studies on the solution of local environmental problems, an integrated, interdisciplinary, problem-solving approach. The findings of their research studies should then provide the necessary substantive data that is to be fed into the curriculum materials.

Already many aspects of environmental problems have been incorporated in curricula. Even global issues, such as those related to energy, have begun to appear. Yet such fundamental questions as the implications for both energy management and increasing disorder, the underlying scientific principles of which are well known, do not appear to have been considered adequately in curricula as yet.

For example, energy output equals energy inputs; all energy is conserved and not destroyed. Yet if it is in the form of heat, *unless there is a differential temperature,* energy cannot be extracted and put to work. Similarly, any ordered system tends to drift towards disorder: establishing order in one place in a system has a *counterpart of disorder* in another part of the system. The implications of these fundamental laws of science (the first and second laws of thermodynamics) have not been sufficiently taken into account in the deeper aspects of environmental education. Even less has there been consideration given to the possible applicability of these laws to the domains of other disciplines such as the social sciences.

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* Thirty-six projects in integrated science alone are listed in: Asian Regional Workshop on the Progress of Integrated Science Teaching, Manila, 3-17 August 1970, *Integrated science teaching in the Asian region*, Bangkok, Unesco, 1971, p. 42-44.

An important global issue that *has* found considerable elaboration in curricula is the population problem. Almost every country in the region has developed a variety of materials related to population education, for learners at different levels in the school system as well as those who are out of school. The infusion of population education into both formal and non-formal curricula has inspired the development of modular methods so that content units may be integrated into subject areas as required.

Audio-visual materials, including charts and posters, and radio and TV programmes for in-school populations, have been specially designed in a few of the Member States of the region. Three of them have reported 'semi-integration', especially between social studies and science and, when second-level education is reached, broadening to incorporate more of national development aspects.

There is some evidence of the Concentric Curricular Model being adopted in the planning of activities in environmental education in some countries in the region. This model assumes that it should be possible to move the students step by step through a series of expanding 'concentric circles', with the environment most familiar to them in the central core and with less-familiar and wider environments occupying successive circles.

For example, in the teaching of an environmental topic such as pollution, aspects of pollution are initially considered in the neighbourhood

around the home or school, and then successively at the municipal, provincial, regional, national and global levels. Thus, by beginning at a fairly personal point and moving outwards in ever-widening circles, students are made aware of the way in which their personal actions, multiplied by countless other similar actions, affect all of humankind—including themselves.

The existing mechanisms for curriculum development in the formal school have been utilized in all countries in the region. In a few countries, separate units in the curriculum development centres have been set up specifically for environmental education. In others, cells in existing subject matter units have been charged with the responsibility of incorporating environmental concerns in their respective discipline areas.

While much work on environmental education has been going on in tertiary research and development institutions throughout the region, there have not been any systematic interrelationships established between curriculum development centres for the acquisition of content and other inputs for curriculum development. The reasons for this are two-fold. First, the mechanisms for mobilizing available knowledge have not been sufficiently developed between tertiary institutions and curriculum development centres and, second, effective techniques for translating available knowledge into a form which will be convergent with classroom requirements—including the maturity level of the students—are lacking.

In non-formal education for the out-of-school population there seem to be several knowledge-flow systems, especially because many of such educational programmes are the responsibility of departments or ministries other than the Ministry of Education which undertake socio-economic activities. In some Member States, institutions outside the Ministry of Education, including non-governmental bodies, have produced a variety of resource materials, including audio-visual aids which could support both curriculum development and actual teaching in the classrooms.

Teaching strategies

Most of the decisions regarding man's use of the environment are based on economic, political, social and ethical considerations. Thus, it becomes the task of teachers to discuss the social, political, economic and the *moral* desirability of the actions we pursue in environmental situations.

In most countries in the region, the emphasis in environmental education is on factual learning. A few countries, however, have stressed problem-solving as a pervasive pedagogical strategy. In such classes, there is a substantial amount of peer-learning through discussion groups.

In only limited cases is use being made of such learning resources as learner interaction with the community or parents or with such specialized

resources as developmental project personnel. Field trips, visits to developmental project sites, exhibitions and other supportive learner activities also take place in some countries and, since there are agricultural extension programmes in most countries in the region, a fair degree of active learning is taking place in the non-formal education sector.

A survey of present educational methods, particularly in secondary education, indicates that students in schools are being taught the geographical, historical, ecological and social aspects of planet earth but only in rare cases are they made to understand the complex nature of the natural and the built environments resulting from the interaction of these as well the biological, physical, economic and cultural aspects.

Teacher training in environmental education

Teacher training is an essential component of any environmental education programme, for it is increasingly being realized that it is the responsibility of teachers to prepare their students to make sensible judgements regarding controversial environmental issues. Teachers need also to be adequately informed about issues in their biophysical environment if they are to effectively help their students face growing environmental problems.

In planning teacher education (pre- and in-service) the following two roles for teachers of environmental education should be stressed:

a) to develop environmentally literate and responsible citizens, and
b) to present a balanced view of environmental facts.

Pre-service training. In the pre-service education of teachers, environmental themes can be incorporated into teacher education programmes so that prospective teachers will be prepared to make their contribution in this area of education. Moreover, teacher-trainees should be exposed to a wide variety of methods and materials, wherever possible.

Teachers are gradually being prepared for environmental education programmes being introduced in schools in the region. In some countries, pre-service courses in environmental education exist for intending teachers. In these countries, there has been the recognition that only teachers who are themselves concerned about their environmental community will develop similar behaviour in their students. There also appears to be a widespread recognition that skills in problem-solving and skills in presenting a holistic approach to environmental issues are not easily acquired and need to be incorporated into the existing training programmes.

In other countries, special courses in ecology, conservation of natural resources, outdoor-education, science, social studies and geography are included in the units of study for intending teachers for both primary and secondary levels so as to familiarize them with environmentally-linked subject matter.

In-service training. Many environmental educators have stressed the need for schools to provide strong in-service training programmes that will assist teachers now in service to acquire the skills and the knowledge in environmental education necessary for guiding the youth they serve. Such training is being given in some member countries. These courses exist for both primary and secondary teachers; their duration varies from short sessions of a few days to post-graduate courses extending over several years. Some of the in-service courses have made use of the multiplier effect in training their key personnel who are then expected to become involved in training workshops for other teachers in their own localities and so-on. And in some countries, post-graduate courses in environmental education have trained people for key posts in universities and colleges.

Some of the in-service courses mentioned above offer experiences on the major processes of environmental education, such as problem-solving, although the majority of them tend to concentrate on the 'philosophy' of environmental education and on aspects of the ecological content. There are also some efforts in learning by doing, where teachers are informed

about environmental issues through the exploration of real problems in the local environment as well as through self-learning modules.

Evaluation in environmental education

In recent years there has been an influx of environmental curriculum materials into the educational market, a large share of which have been developed in the West. Surprisingly, most of them have no evaluative component built into them.

Evaluation, although the second stage of curriculum development, has not received much attention from curriculum developers. The reason for omitting the evaluative stage in curriculum development may partly be found in the lack of adequate evaluation techniques or guidelines. This is true regarding the evaluation of each of the following three dimensions of environmental education: (1) curricula, (2) pupil achievement, and (3) teacher performance.

When evaluating curricula related to environmental education, especially where environmental education is integrated into other subject areas, the processes and techniques of evaluation become complicated. This means that specific instruments and devices have yet to be developed to evaluate the environmental education component in an integrated course.

When evaluating pupil achievement in any environmental education programme, a number of other problems arise. First, in common with evaluation in other subject areas, evaluation of cognitive achievement beyond factual recall requires ingenuity. Second, effective teaching and learning involves interaction in the community for which evaluation tools are presently lacking. Third, as in the evaluation of affective-domain objectives in other subject areas, it is not easy in environmental education to evaluate overt behaviour exhibited by pupils in their daily living.

Finally, the evaluation of teacher performance in the context of environmental education concepts which are integrated into existing subject areas of the curriculum appears also to pose difficulties since a variety of teaching strategies such as team-teaching have to be adopted and content areas become integrated in the teaching, thereby causing teachers to instruct in content which may not be their own specialization. In a few countries in the region, nevertheless, specific tools have been developed to study pupil's perceptions, understanding and interests regarding the environment—although it appears that much more needs to be done in this area.

* * *

Environmental education is a new area of educational action in many countries of the region but is growing apace with a deepening awareness of the issues involved. Regional co-operation for inter-country exchange and sharing of experiences is vitally important to strengthen and stimulate educational initiatives at the national level.

In offering the present publication as a contribution to such regional co-operation, the Unesco Regional Office for Education in Asia and the Pacific wishes to express its indebtedness to the authors of the articles presented here and to various institutions, organizations and individuals who have helped us by providing data, illustrations and other materials. ☐

SECTION TWO

ENVIRONMENTAL EDUCATION IN COUNTRIES OF THE REGION

Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
No. 22, June 1981

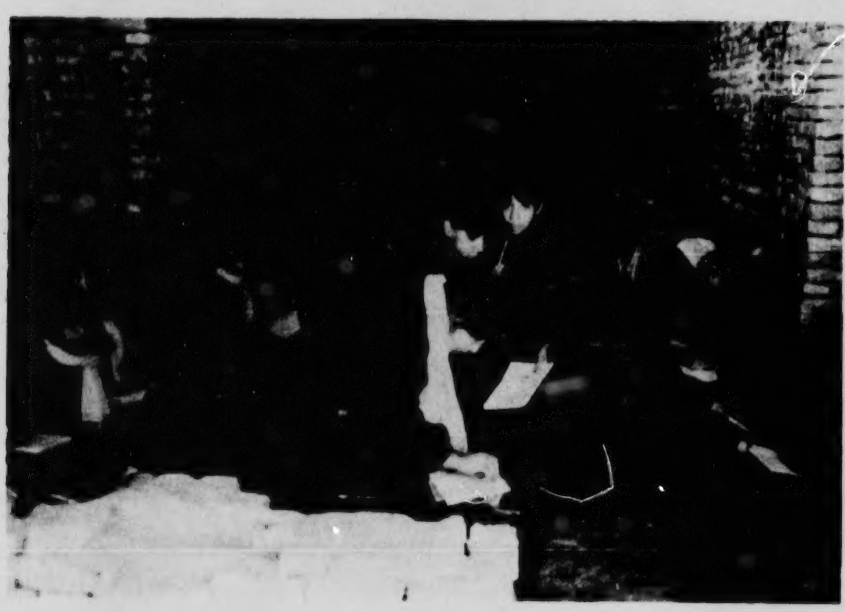
AFGHANISTAN

by Abdul Wadood Wafamal

National mandates

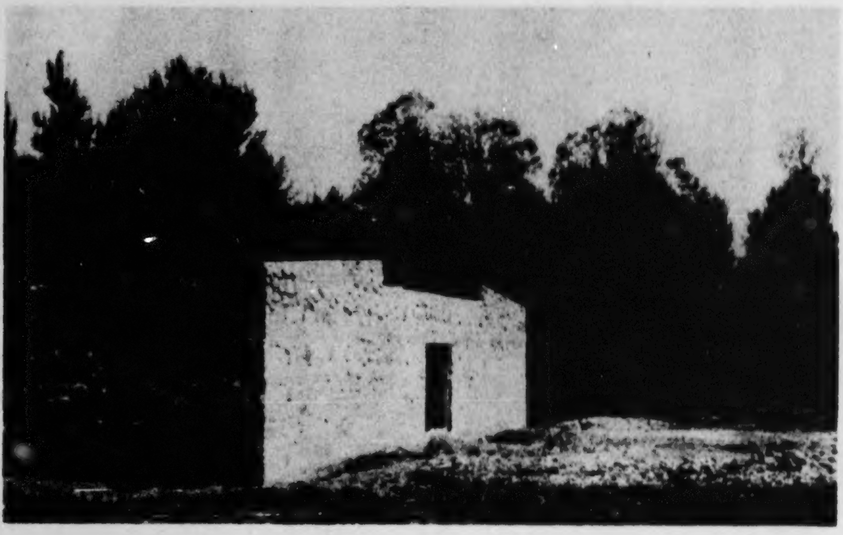
The Government of the Democratic Republic of Afghanistan is in the process of consolidation in order to establish a developmental system most suited to the people. Major developmental efforts need time to show significant results and the Democratic Republic in Afghanistan was installed only recently. Within a short period, nevertheless, the Government has taken stock of the situation, is clear about what is to be done and is fully aware of the major operational problems in implementation of some of the schemes.

In education, a new ten-year schooling cycle is being introduced against the present 12-year cycle. This switch-over has been planned in



appropriate phases. This major change naturally calls for the introduction of revised curriculum in such a manner that it is adopted smoothly not only in school grades but at the same time in the country's teacher training institutions.

While working out this revised curriculum the importance of environmental education as an integral part of general education has been fully recognized. While there is no legislation on this subject so far, the education decision-makers in the Democratic Republic of Afghanistan are seriously searching for ways and means to introduce environmental studies at all grade levels in most of the subjects in a manner appropriate to each subject area, respective age group of the children and conditions of the local environment. These decision-makers have not considered the incorporation of environmental education as a separate discipline in school curricula but the approach would be characterized by flexibility and relevance to the situation at hand. Some significant headway in this direction has been made as in, for instance, the introduction of health education as a major subject in primary schools and the increasing utilization of local resources (the environment) in science education. Much has yet to be done to achieve these goals. A pilot project for the prime purpose of infusing aspects of environmental education into science education was initiated and will be discussed briefly further on.



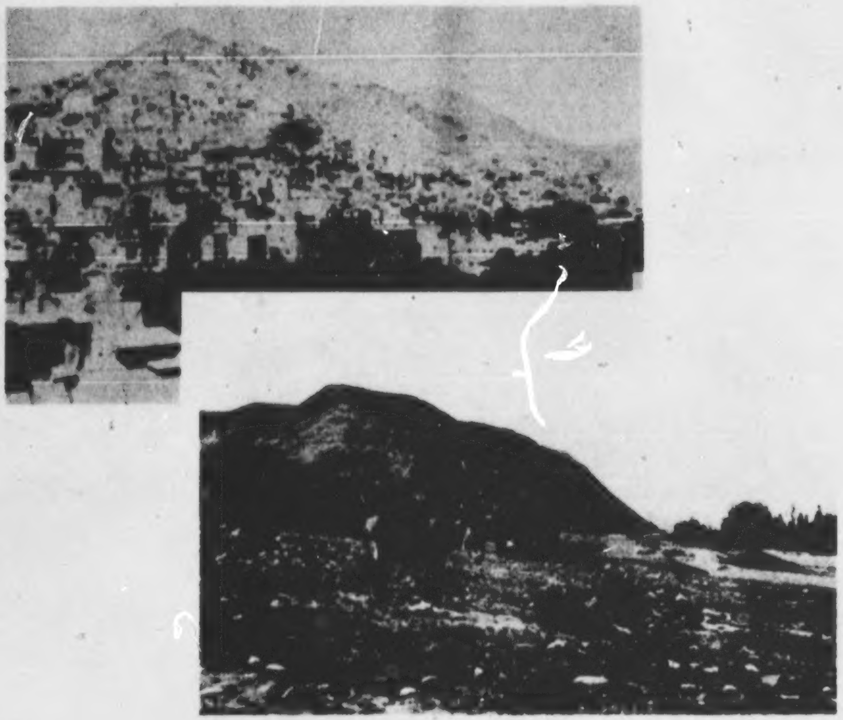
Major environmental problems and issues

The major environmental problems in Afghanistan might be identified as follows:

1. **Macro kind**
   - a) Soil erosion
   - b) Extinction of wild life
   - c) Deforestation
   - d) Lack of potable water, and
   - e) The energy crisis and related issues.
2. **Micro kind**
   - a) Poor health and sanitation
   - b) Social and family problems
   - c) Inadequate housing, and
   - d) Population growth in almost every family.
3. **Global ecology**

   Afghanistan does not, as yet, foresee critical environmental problems which would effect the global ecology of the world.
4. **Environmental considerations**

   Environmental benefits to be realized have influenced a great deal such decisions as the one to operate electrically-powered buses in the city of Kabul.



Pilot project in environmental education

Along with the introduction of health education as a major subject at the primary level, a significant step was made with the development and implementation of a Pilot Project in Environmental Education for grade-VII students. The task of its implementation in schools situated in ecologically different provinces of Afghanistan was given to the National Science Centre. The project, which lasted one year, covered students in grade VII in six different provinces of the country. The total cost of US $35,000 was shared by the National Government and Unesco.

The aim of the project was to teach students to become more ecologically minded, and to understand the inter-relationships of humans and their immediate environment. It was believed that grade-VII students are not only mature enough to grasp the contents of the materials produced but also that they are in a schooling stage at which exists a sound basis for introducing environmental education to the existing curriculum for further development of this field.

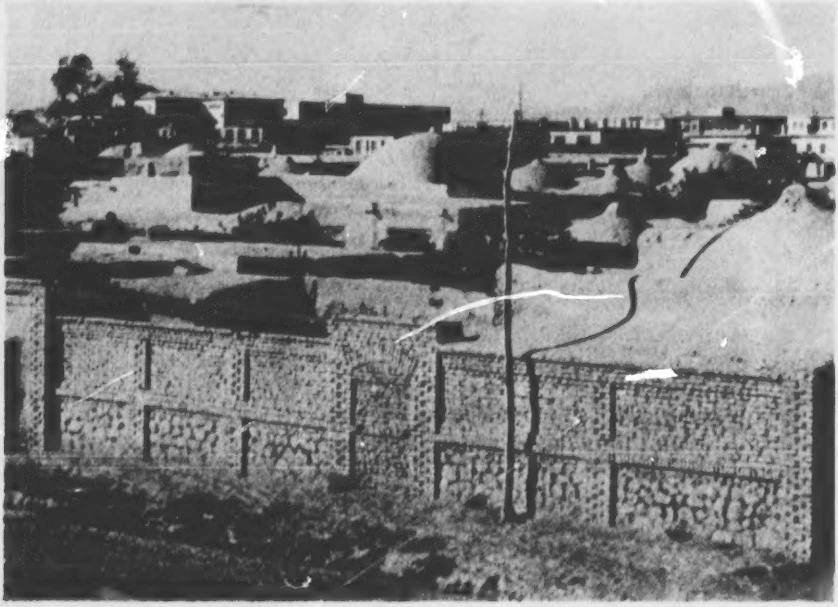
Since the project was at the stage of trial-testing, environmental education was introduced to students of grade VII as a separate subject in the form of self-learning modules. The activities included simple, practical and safe experiments, lectures, films, study-tours and field trips.

Before adopting the curriculum a survey of various provinces was conducted. Thereafter, experienced secondary school teachers were invited to a workshop to point out jointly the major environmental issues and choose a unified course to be incorporated in the school curriculum.

As a result of this workshop, subjects of the learning modules were specified. In terms of the teaching materials a guide for teachers was also developed. The modules, together with the teacher's guide, were then mass-produced and introduced to students and teachers through a trial-testing which lasted for two months. To ensure successful implementation of the project a seminar was conducted in the National Science Centre for about 40 teachers, science supervisors and experienced people outside the Ministry of Education. The results derived from this Pilot Project were considered very satisfactory and encouraging.

Afghanistan is a wide country and its provinces have different ecological characteristics with different environmental issues. Not all problems, therefore, are common to all of the regions. Some are at high altitudes and some at low. Then too, large cities have problems of sound/air pollution but not so the villages. Thus far, radio-active waste does not pose serious dangers to Afghanistan's ecosystem as it does to countries having atomic reactors.

The pilot project described above has given valuable experiences to those responsible for curriculum development. For example, a survey of the 600 students revealed a high degree of interest in such topics as soil conservation, forest conservation, wild-life conservation, community health and safe drinking water. These topics are not only practical but related to their real-life situation.



As already stressed, however, this project operation was on a very limited scale. A great deal of work has yet to be done before the right type of environmental education is introduced at all levels of education both in and out of school. Many more trial projects, small- and large-scale, will have to be undertaken to determine the curricula most suited and common to all and to work out special features for special regional requirements.

Regional help will also be needed in identifying, planning, execution and evaluation of such projects, in terms of sharing experience, since our experience in this field is limited. At the same time financial assistance from the United Nations Environment Programme (UNEP) and Unesco will be required to execute small and large-scale projects. ☐

Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
Number 22, June 1981

AUSTRALIA

by David M. Stokes

Introduction

This article attempts to take an Australia-wide perspective but draws on examples from Victoria more than the other states. The major area reviewed relates to teacher education.

Australia has a population of more than 14 million, divided across six states, with the majority of these people confined to the coastal fringes, particularly the eastern seaboard. As one of the developed countries in the region, Australia faces some significant national environmental issues.

Much of modern Australia has been built on features brought from Europe even though the country has a very different ecology. The importation of new plants and animals, such as the rabbit, has often had a very significant effect on the environment. Many of Australia's flora and fauna are unique and, in many cases, are subject to destruction because they have not been able to compete with some of the exotic varieties intentionally or accidentally introduced. In the future, Australians will need to be vigilant if these unique flora and fauna are to survive.

Australia is rich in resources such as coal and minerals, and produces large quantities of the world's supply of meat and wheat. World demand for these commodities will mean that Australians will play a major role in the future of many peoples of the world. The future use of Australia's energy/resources and reserves of bauxites, iron ore and other minerals has far-reaching national and world-wide environmental implications which Australians will need to face.

Other national environmental concerns include soil erosion and the deterioration of soil quality, removal of native forests for timber and wood-chips and land-rights for aboriginal communities affected by large mining operations. Together with these national concerns there are regional concerns. Development has brought water pollution in the Murray River, smog problems in Sydney and Melbourne and pressure on Alpine resources. Impacts of mining and hydro-electric power development have produced and are producing effects on people and the environment at the regional level.

Use of resources has regional implications. Here, 'open-cut' coal mining in Australia is done with a gigantic bucket-wheel excavator which dwarfs a large bulldozer in the distance (after mining, the mining company is required to re-stabilize the environment).

Under the Australian federal system, responsibility for environment is spread across six State Governments and the Federal Government. Thus all six State Governments have ministers and departments responsible for environment although the structure of these departments varies from one to another. At the federal level, environment has been included as a ministerial responsibility since 1971. Since that time, Environment has been coupled with Aborigines and the Arts, Housing and Community Development, Science and most recently with Home Affairs.

In addition to these state and federal bodies, there are other national organizations with responsibilities for aspects of the environment. These include government bodies such as the Australian Environment Council and the Council of Nature Conservation Ministers, both of these councils comprising Commonwealth and State Ministers. Other bodies such as the National Parks and Wildlife Service, the National Energy Advisory Committee, and the Australian Heritage Commission to name but a few, play an important role in the shaping of Australia's environmental policy.

Non-governmental bodies at both state and federal levels are also important. For many years, the Australian Conservation Foundation has been significant in shaping public attitudes to environmental issues.

An awareness of Australia's fragile ecology and special problems has resulted in some environmental initiatives. At government levels, the environment protection legislation on noise and water pollution and state and federal efforts in protecting natural resources have made a signficant contribution to the standard of living. The Westernport Bay Environmental Studies series in Victoria is well documented as one of the largest environmental assessments ever conducted anywhere in the world. The measures taken to prevent sand mining on Fraser Island and to protect the island's ecology have received world-wide publicity. The successful campaign by Unions to preserve The Rocks area of Sydney and unsuccessful attempts to save Lake Pedder were important environmental issues for many Australians.

The country has, however, some special environmental problems. In the future, the search for alternative energy sources including the conversion of brown coal to oil, shale oil development and the development of the uranium industry will be particularly important issues. The use of land and water to provide significant proportions of the world's supply of meat and wheat will present Australians with significant environmental challenges. With this brief background some recent developments in environmental education in Australia may be outlined.

Education

Education *about* the environment is not new to the curriculum. Education *in* the environment is not new either, although both of these have been presented in an unco-ordinated way in the past. What is new is education *for* the environment, and it is this in particular that will be discussed here.

In Australia, education programmes in schools are determined largely by state departments of education, although the Commonwealth Department of Education determines curricula in the Australian Capital Territory and the Northern Territory. Thus to discuss thoroughly environmental education in the country would require an analysis of the plans of each state and the Commonwealth Department of Education. Although this is clearly not feasible here, it is possible to outline some significant national initiatives which have had a major influence on the states.

In 1972, the United Nations Conference in Stockholm focused world attention on international environmental issues. In 1974 the Curriculum Development Centre in Canberra began a number of programmes to foster

Crowded city streets cause air pollution in some of Australia's big cities.

environmental education in Australian schools. Through the 'Environmental Education Project', the Curriculum Development Centre intends to develop primary and secondary student and teacher materials for primary and secondary environmental education, principally in the form of case studies. A second programme, 'Investigating the National Estate', is intended for lower to middle secondary levels, (Greenall, 1979).

As a direct result of these projects the Curriculum Development Centre has established liaison officers in the state and commonwealth education departments and these liaison officers have met regularly to discuss environmental education. These regular meetings have encouraged the states to formulate goals for environmental education. A national Environmental Education Association has been formed and a regular *Newsletter* is now published. In Victoria, a Joint Committee on Environmental Education (JCEE) has been formed to advise the Curriculum Council—the most senior curriculum-determining body within the Victorian Education Department—on future developments in environmental education in Victoria. The recommendations of the JCEE will have been made to the Curriculum Council before mid-1981 (Wilson 1980).

A large number of support services also contribute to environmental education in Australia. Some of these support services are governed by independent councils, others have a formal place within existing education departments while others have neither. Some of these support services which provide materials for children or information for teachers on environmental education include the Australian Conservation Foundation, zoos and botanical gardens, State Rivers and Water Supply Commission, Soil Conservation Authorities, National Environmental Teachers Associations, and one of the oldest groups providing information and materials on environmental issues, the Gould League. The Ministry for Conservation in Victoria now publishes a comprehensive Environmental Education Resource Directory which provides up-to-date information on materials teachers will find useful in environmental education.

Curriculum development in environmental education

Definition and scope. After several meetings and conferences at both state and national levels, the Australian Association for Environmental Education has been formed. This association held its inaugural meeting in Adelaide in October 1980. Largely through this group, which was formed as a direct result of the meeting of the State Liaison Officers and the development of the Curriculum Development Centre's project on environmental education, the defining characteristics of environmental education have received widespread discussion over the last few years. Beginning in the early 1970s but gaining momentum later in the decade, there has been a growing awareness in Australia of the need for environmental education. This awareness has led to a fairly widespread consensus on the defining characteristics of environmental education. Fensham (1980) has summed up the consensus view of environmental education by noting that:

- it is oriented towards a problem or an issue,
- it aims to elaborate the alternatives that exist for situations and the skill of choosing between them,
- it is concerned with realistic situations,
- it transcends individual disciplines,
- it includes actions and an integral component,
- it uses the real environment of the school and its surroundings as a context,
- it involves the clarification of values, and
- it aims to manifestly increase the competence and confidence that students have within their own environments.

Although objectives for environmental education, if they have been set, vary from state to state, level to level and school to school, the Curriculum Development Centre has recently included environmental education in its *core curriculum,* (CDC, 1980). By core curriculum, the Curriculum Development Centre means the set of basic and essential learning and experiences which can reasonably be expected of all students.

Basic learning is defined as that which provides a base or foundation necessary for *other* study and learning, and for continuing personal development. Essential learning and experiences are defined as those which are required by all for effective cultural, economic, political, group, family and interpersonal life in society.

The inclusion of environmental studies as one of the nine core areas of the core curriculum is a very significant step. In the core curriculum document, the Curriculum Development Centre states that . . .

> the central purpose of environmental studies within the core is awareness and understanding of both the physical and man-made environments and sensitivity to the forces that sustain or may destroy them. This requires both geography, landscape architecture, economics, etc., and a readiness by schools to participate in environmental maintenance projects which give students practical experience in the field. As in other areas of the core, there is an emphasis on social action–environmental studies represents a blend of theory and practice which may be organized in many different ways. Within the core what is important is not the particular kind of organization but the environmentalist approach or perspective. This is an amalgam of types of knowledge and understanding and a disposition to sustain and protect the environment.

Strategies for introducing environmental education

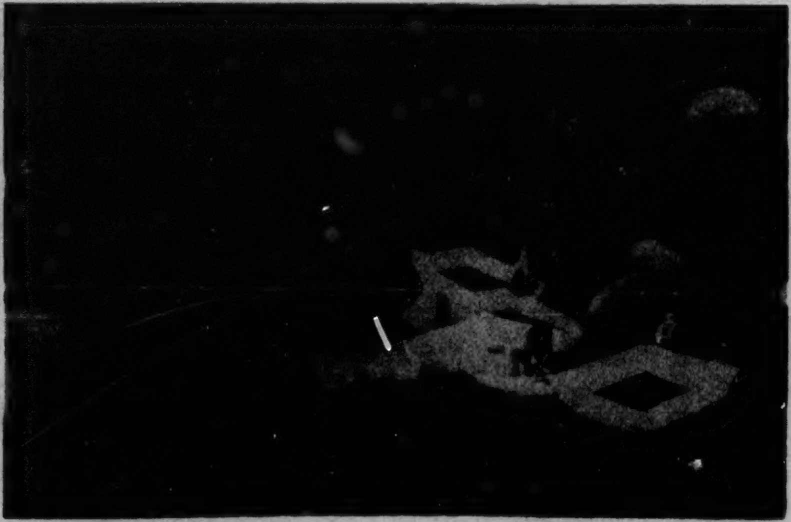
Various strategies have been suggested for environmental education in schools: all of these are being used to some extent in Australia. (Womersley and Stokes, 1980). At the primary level, where one teacher is for the most part with the same group of children all day, the major approach is to organize environmental studies around a particular geographic area, theme or skill. The study may last for several lessons, or weeks. At the secondary level, where knowledge is divided into disciplines and where children study many subjects under many teachers in any one day, the situation is organizationally more complex.

The most popular strategy is the 'infusion approach' where environment is added to existing subjects. In this approach, sections of the content of an environmental education programme may be clearly associated with a particular discipline or subject in the existing curriculum. In these circumstances, the responsibility for different aspects of the content of the programme may be taken by different teachers with specialized knowledge or experience. For example, if the chosen content is focused on the chemical pollution of an urban waterway, then chemistry can contribute to an understanding of the pollutants and the chemical characteristics of the waterway. Biology can contribute to an understanding of the natural flora and fauna and the impact of pollutants on the physiology of these populations. Geography can contribute to an understanding of land-use patterns, drainage patterns and climatology, all of which may have an effect on the concentration of pollutants in the waterway. History and social science may contribute to temporal and human perspectives, literature and music can provide avenues for expression using poetry, letters, dialogue and other forms. Some subject Associations, particularly those for biology and geography, have been more enthusiastic than others; nevertheless, the Curriculum Development Centre's environmental education project has specifically tried to promote environmental education through *all* subject areas.

A second strategy for environmental education in schools involves organizing environmental education through the basic concepts which define its scope; this may lead to a separate-subject approach. These concepts are biophysical, socio-cultural, and management- and change-oriented and can form the basis of a balanced programme. (See Conceptual Framework at the end of this article). These concepts concerning the environment have been used in schools to devise themes or topics which have then been introduced as parts of subjects or as whole subjects. In Victoria, 'Environmental Science' has been introduced as a subject in grade XII and many other environmental subjects have been developed in grades VII to XI.

A third strategy, widely used, involves organizing through case studies 'environmental encounters' or what have been called 'junctions'. Real-life situations are chosen and the whole school or group of students from a particular year, together with their teachers and local experts, focus on the situation. The encounter may last for several days or weeks but the basic idea is to focus the traditional elements of the curriculum on a particular issue and to thus explore what additional knowledge, skills and attitudes may be involved in solving environmental problems. Methods appropriate to the particular issue or case study are used. The real world as represented in the press, on radio, on television, in the local community, nationally or internationally, can provide a wide and varied stimulus for these environmental encounters.

In Australia, this approach has been used within traditional subjects and within separate environmental studies subjects but it has rarely been used as the major way of integrating environmental studies either horizontally across a particular year or vertically through a particular school programme. As a means of introducing environmental education at the school level the environmental encounter or junction has therefore a great deal of unexplored potential.



Students and staff of Environmental Studies studying river pollution

A fourth strategy has been described as 'organizing through processes'. Two of the major processes in environmental education are problem solving and values clarification. Either of these processes when combined with the objectives of environmental education and an appropriate learning situation can be a valuable tool in environmental education. For instance, Stapp has said that there are seven recommended steps in the problem-solving process; (1) identifying and defining the problem; (2) collecting, organizing and analysing the data to relate it to the issues; (3) generating and evaluating alternative solutions; (4) evaluating the alternatives and selecting the best solution; (5) developing a plan of action; (6) implementing the plan; (7) evaluating the plan. Ideally this strategy should be combined with the environmental encounter. This fourth approach has so far been least used in Australian schools and since environmental issues are about values and problems this is a pity.

All four strategies will be enhanced by the publication of the Curriculum Development Centre's projects on 'Environmental Education' and 'Investigating the National Estate'. The Environmental Education Project will include a *Sourcebook for primary education* (a set of readings on planning for environmental education, language, arts, outdoor activities and living things); a planning simulation and local urban activities for students. The *Sourcebook for secondary education,* to be published in 1981, includes a set of readings on Planning for Environmental Education;

Environmental Education in the Humanities; Environmental Education in Home Economics and Manual Arts; Environmental Education using an Interdisciplinary Approach; and Junior Secondary Outdoor Activities. These curriculum materials will add to a long list of materials which cover aspects of the environment, particularly in science and geography. For secondary schools, the Australian Science Education Project, the Junior Secondary Science Project and the Social Education Materials Project all contain materials about the environment. For senior secondary schools, materials which have been developed for biology, geography, earth science and home economics contain many of the concepts and principles of environmental education.

The major point being made in this section is that a wide variety of materials and strategies are available for environmental education in Australia. The next section examines to what extent teachers require new skills in order to use these strategies and materials effectively.

Teacher education for environmental education

Elements of environmental education, particularly education *about* the environment have been included in pre-service and in-service programmes for teachers for many years. Courses for teachers in the biological sciences, geography, agriculture, nature study and others have all included knowledge about the environment. Education *in* the environment is also not new. Outdoor studies, field studies and various other disciplines have often taken place outside the classroom in the environment. What then is so different about environmental education today and what are the implications for the training of teachers?

First, environmental education is education *about*, *in* and *for* the environment. This means that it will include knowledge from a broad range of disciplines, involve real experiences in a wide range of appropriate environments, and because it is education for the environment, will be about *attitudes and values*. Much of teacher education, particularly in science–which up until recently is where most of the teaching about environment has occurred–has avoided value questions on environment. Scientists have often said that their role is to teach *about*–for example–nuclear power, but questions involving such things as *distribution of energy, waste disposal, energy needs* of people in the region and *poverty* are not considered part of their teaching programme. Environmental education for teachers in the 1980s, in this region in particular, cannot afford to avoid questions such as these. It must *confront* these issues.

Second, environmental education is about natural, social and cultural systems; that is, it *crosses disciplinary boundaries*. This is a particularly

Studying plant ecology

Studying water analysis

Teachers will need old and new skills if environmental education is to succeed. Shown here are students at work in Environmental Studies.

Studying solar technology

Studying geology

important characteristic of environmental education and yet schools, colleges, and universities divide knowledge into disciplines. This is not to say that disciplinary approaches to environmental education are not important–they are–but interdisciplinary approaches are also required if solutions to the complex issues facing the region are to be found. Interdisciplinary approaches to issues in teacher education will require curriculum innovations at both post-graduate and graduate levels. These innovations will need to explore the kind of knowledge and skills which are required for integrated approaches to problems, the mix of specialist versus generalist knowledge required and the mix of interpersonal skills versus disciplinary skills.

Third, environmental education is about solving real world problems in an active and inquiring manner. This means that it is about acquiring skills and knowledge which can be applied to particular problems and issues. This may seem similar to what teacher education is seeking to do. Environmental education differs, however, in that many of the future problems or issues it seeks to address will be very different from problems previously encountered and these will require new skills.

Teacher educators will need considerable assistance if they are to design curricula which highlight problem-solving skills as well as knowledge. Current approaches to the teaching of skills certainly highlight data collection and perhaps analysis but much more emphasis will need to be placed on problem identification, decision-making and implementation skills such as leadership, motivation, conflict resolution and administration. Environmental education will also require more first-hand experience of complex problems which cross disciplinary boundaries. Teacher educators will need considerable assistance if they are to gain the confidence to use real world and complex issues in teacher education.

Finally it should be stressed that environmental education is about team-work approaches to complex issues. It involves people, often with diverse backgrounds and skills, working together in groups on complex problems, which may have many alternative solutions, and which may be very different. If teachers are to cope with the complexity of environmental education, sound innovations relating to team-work will be required. Much of higher education at the moment concentrates on individual learning. It usually involves specialization followed by isolation in a discipline bounded by closed methods and knowledge. More emphasis will have to be placed on teaching people the importance of using different approaches to problems, understanding in broad terms the approaches used by different disciplines, and acquiring a basic literacy in several of the key disciplines in environmental studies. Interpersonal skills such as communication, leadership, resolving conflicts and respect for other members of the team will be important. Curricula which emphasize these team-work skills will be needed if environmental education is to succeed.

Teacher education in Australia

One important aspect concerning environmental education in Australia is the period of time which has been required to form a nucleus of people of sufficient size who are capable of influencing the *large majority* who have little concern for environmental education. For several years some specialists in teacher education, some school teachers, some regional directors of education and some individuals within the community have formed a growing body of people seeking to have environmental education formally introduced into the school curriculum. In Victoria, an Environment Teacher Association has now been formed. A recent inquiry into teacher education has said that:

> ". . . the Education Department, the Catholic Education Commission, the Division of Pre-School Child Development of the Health Commission and all schools, together with teacher education institutions, should take up the spirit of the Belgrade Charter." *Interim Report of the Committee of the Victorian Enquiry into Teacher Education, 1980.*

It will be a long time before all these bodies take up the spirit of the Belgrade Charter, but there have been some significant initiatives in teacher education in Australia over the past few years and some of these have used the Belgrade Charter as a guide.

Pre-service teacher education

In many universities and colleges in Australia, prospective primary and secondary teachers are introduced to environmental education as part of their teacher training. In some colleges this introduction occurs primarily as education about ecology and is firmly based in the knowledge component of the degree. In other colleges, environmental education is offered after disciplinary training has been completed,and is approached as a methodological study.

The Rusden College of Advanced Education has been conducting a programme for the training of secondary teachers in environmental education for more than seven years. Because the course is an attempt at a total approach to environmental education throughout the four-year pre-service period and because the course has produced more than 150 graduates, most of whom are now teaching in Victorian secondary schools, this course will be described in some detail.

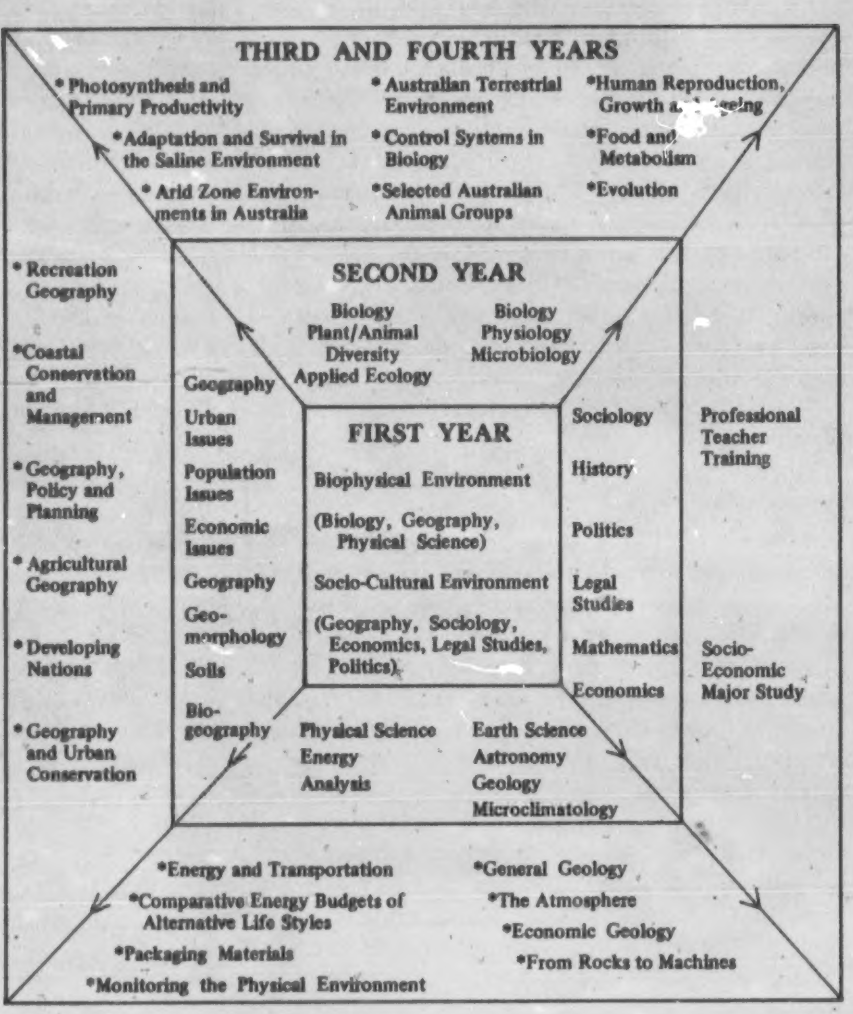
At Rusden in 1973, the separate departments of physics, chemistry, biology, earth science and geography and later the mathematics department were amalgamated into a single department–the Environmental Studies Department. The decision to create such a department was taken because environmental studies teachers were seen to be needed by the education department of Victoria, secondly because no undergraduate tertiary programme in environmental studies existed in Victoria at that time and thirdly because recommendations from Stockholm suggested that countries in the region should begin pre-service teacher education programmes for environmental education. The Environmental Studies Department was therefore set up as one comprehensive department with a defined budget, facilities and staff.

The establishment of a single department concerned with pre-service education for teachers of environmental studies may be the most significant step organizationally speaking that the College has made. Fensham (1980) has said that one of the basic problems with environmental education is the problem of interdisciplinarity and he says that there have been considerable attempts in recent years to introduce an interdisciplinary approach to environmental studies. Almost universally, however, this has met with considerable resistance in institutions that are primarily organized on a departmental and disciplinary basis. The sheer logistic problems of co-operation across departments militate against change. He says that more sharing of experience about how to integrate studies in the university and college context for both undergraduate and investigative studies at the graduate level is needed.

The decision to form the broad Department of Environmental Studies meant that many of the problems to which Fensham refers just have not been part of the Rusden experience. The collective expertise there includes nine staff with training in the biological sciences, six with training in geography, six with training in the physical and earth sciences and three with training in mathematics. All of these people have specialist qualifications in disciplines related to environmental studies together with qualifications and experience in education. The department has its own facilities, its own equipment–some of it highly sophisticated–and a mandate to provide a four-year course which will produce teachers fully qualified to teach environmental studies.

The course in environmental studies aims to produce an environmentally literate citizen who is knowledgeable and skilled in matters relating to the environment and motivated to employ these skills and knowledge within the community. The programme centres around four main features, *knowledge, specialization, team-work* and *professional teacher training*. The structure of the course is outlined in Figure 1.

Figure 1. Environmental studies at Rusden University


THIRD AND FOURTH YEARS
* Photosynthesis and Primary Productivity
* Adaptation and Survival in the Saline Environment
* Arid Zone Environments in Australia
* Australian Terrestrial Environment
* Control Systems in Biology
* Selected Australian Animal Groups
* Human Reproduction, Growth and Ageing
* Food and Metabolism
* Evolution
* Recreation Geography
* Coastal Conservation and Management
* Geography, Policy and Planning
* Agricultural Geography
* Developing Nations
* Geography and Urban Conservation
SECOND YEAR
Biology Plant/Animal Diversity Applied Ecology
Biology Physiology Microbiology
Geography
Urban Issues
Population Issues
Economic Issues
Geography
Geomorphology
Soils
Biogeography
FIRST YEAR
Biophysical Environment
(Biology, Geography, Physical Science)
Socio-Cultural Environment
(Geography, Sociology, Economics, Legal Studies, Politics)
Sociology
History
Politics
Legal Studies
Mathematics
Economics
Professional Teacher Training
Socio-Economic Major Study
Physical Science
Energy
Analysis
Earth Science
Astronomy
Geology
Microclimatology
* Energy and Transportation
* Comparative Energy Budgets of Alternative Life Styles
* Packaging Materials
* Monitoring the Physical Environment
* General Geology
* The Atmosphere
* Economic Geology
* From Rocks to Machines

Knowledge

The desire of students at the start of the course to work within fairly traditional subject boundaries is compatible with the course structure. Linke (1975) has said that before complex research activities involved with tertiary environmental studies programmes can be attempted, a considerable degree of academic expertise is required.

The first two years are seen as a time when students gain much of this academic expertise. The course in the first two years--particularly in the first year--does lean toward science. The course itself does not aim to produce a scientist in the technological sense, however, but a scientist in an ecological sense, a scientist who lives in harmony with (rather than in opposition to) the natural workings of the biosphere. The leaning towards science in the first two years of the course is there because of the belief that scientific literacy is a necessary part of the environmental education process. It is still only part of the process, nevertheless, and a sound socio-economic perspective is provided by the other subject areas including the geography programme. The introductory programme is a composite one and as such different combinations of appropriate subjects can be selected by the student according to individual preference. Linke has said that this may be more satisfactory than having a single, integrated but limited, approach to complex issues which might not hold the same level of interest for all students.

Specialization

In the third and fourth years of the course all students must specialize and undertake their professional teacher training. The teacher-training programme and the academic programme are operated concurrently in the third and fourth years. A completion of two major studies is a requirement of the Bachelor of Education degree, and in the Environmental Studies programme at least one of these major studies must be drawn from either biological sciences, geography or physical and earth sciences. The decision to include specialization in at least one of these subjects as a requirement of the course is based on the conviction that decisions about the environment should be made by people with knowledge in depth in some particular field. The traditional subject areas can cover a wide range of units, thus allowing students to structure a course according to their interests while still retaining the disciplinary specialization. For some students, the study programme they undertake is a fairly traditional one; for others there is a preference for units with a strong environmental orientation.

The department is planning to introduce a subject in interdisciplinary environmental systems which will complement the existing disciplinary studies in each year of the course.

Team-work

The third and essential feature of the course is an experience as part of an interdisciplinary team. This team-work experience is on a selected

Study of cartography as part of Environmental Studies

environmental issue and is taken by all students as part of their work. The aim of the unit is to introduce students to the methodology, the skills involved in solving environmental problems, analysis of alternative solutions to environmental problems, the influence of social, political and value questions on these alternatives and to encourage students to study the decision-making and implementation process. A unit such as this is possible because although the students in the team have different subject specializations they all have a common introductory background to the physical and biological sciences and geography, and they all have a socio-economic perspective. This means that in the formation of specialized teams or of interdisciplinary teams, students have a knowledge of the language of other members of the team, they have respect for the role that other specialist members of the team will play and they have a perception of what the other specialists will be looking for and the methods they will use.

It is only because the Environmental Studies Department is a single department that it is possible to schedule, finance and staff such an integrated unit—which is a central feature of the course. Many issues have been used in the team-work unit. Funding has come from within the college and also from external government agencies. The essential feature of all these projects is that they involve the need for an interdisciplinary team and all have many alternative solutions which could be strongly influenced by the political or social process. Students who are doing the unit study the reality and the hierarchies of power and the local government decision-making process and they explore the full range of skills required in solving an environmental problem. All the projects require a final report to be prepared and presented; this enables students to see that what they are doing is action-oriented, and that their contribution is part of the implementation process.

Professional teacher training

The fourth aspect of the course is the professional teacher training. Up to this point in the course, students have knowledge about the environment at biological, physical, spatial and sociological levels and an understanding of the interrelationships of these and other disciplines in environmental issues. The students also have an appreciation of the interdisciplinary approach required for the solution of environmental problems and the way in which political and social factors influence the decision-making process. The final section of the course is that which aims to give students the ability to develop programmes in environmental education in schools as well as the ability to develop community environmental education programmes. In the seven years that this course has been running, more than 150 graduates have completed it and are now teaching environmental education in some form in Victorian secondary schools. In this section of the course the student is asked to examine the philosophy of environmental education, to see environmental education programmes in operation in schools, to undertake a work-experience programme with a particular agency concerned with environment, and to develop curriculum materials for use in similar programmes. The training at this point attempts to develop a rationale for environmental studies as part of the school curriculum.

In-service teacher education

Some very successful in-service teacher education programmes for environmental education have been conducted in Australia. In-service programmes have the advantage that large numbers of teachers can be trained quickly, and costs are considerably less than those associated with pre-service teacher education.

The major strategy has been the short course of one or two days where teachers attend a regional centre for 'face-to-face' contact. As with most of the pre-service education programmes, the major emphasis up until recently has been on ecology, but several in-service courses now include materials on the urban environment, alternative life styles, energy and our Asian neighbours.

Conclusion

Environmental education in Australia has for many years been education *about* the environment and education *in* the environment. Recent developments in school programmes, in curriculum materials for schools and in teacher education programmes suggest that environmental education *for* the environment is on the rise. As public concern increases about some of the significant environmental issues facing Australians, the value of having a population better equipped to cope with these issues should become more apparent.

A PARTIAL LIST OF ENVIRONMENTAL CONCEPTS
as suggested for environmental education in Australia

Biophysical

- Living things are interdependent upon one another and upon their environment.
- Green plants are the ultimate sources of food, clothing, shelter and energy in most societies.
- An organism is the product of its heredity and environment.
- In any environment, one component (space, water, air, shelter or food) may become a limiting factor.
- The natural environment is irreplaceable.

Socio-cultural

- The culture of a group is its learned behaviour in the form of customs, habits, attitudes, institutions and life-styles that are transmitted to its progeny.
- The relationships between man and the natural environment are mediated by his culture.
- National resources affect and are affected by the material welfare of a culture, and directly or indirectly by philosophy, religion, government and the arts.

Management

- The management of natural resources to meet the needs of successive generations demands long-range planning.
- Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.

- Environmental management involves the application of knowledge in a rational direction to achieve a particular objective or objectives.

Change

- Organisms and environments are constantly changing.
- The rate of change in an environment may exceed the rate of adaptation of organisms.
- All living things including man are continually evolving.
- Man has accelerated the rate of change.
- Increasing human population, rising living standards, and the resultant demands for greater industrial and agricultural productivity can promote increasing environmental contamination.

References

Core curriculum for Australian schools. Canberra, Curriculum Development Centre, 1980.

Fensham, P. *Regional tertiary environmental education.* Canberra, Australian National Commission for Unesco, 1980.

Greenall, A. *Environmental education for schools or how to teach environmental education.* Canberra, Curriculum Development Centre/ Department of Science and Environment, 1979.

Linke, R.D. *Environmental education in Australia: Part I. Final report on a national survey of environmental education in Australia 1973/74 presented to the Australian Advisory Committee on Research and Development in Education.* [Canberra, Australian Government Publishing Service?]. 1975.

Stapp, W.B. and D.A. Cox. *Environmental education activities manual.* Ann Arbor, University of Michigan Press, 1979. 764 p.

Victoria. Committee of Enquiry into Teacher Education. *Interim report.* Melbourne, Victorian Government Printer, 1980.

Wilson, J. *Environmental education: a report on recent developments in Victoria.* Adelaide, Australian Association for Environmental Education, 1980.

Womersley, J. and D. Stokes. *Environmental education: a conceptual framework.* Canberra, Curriculum Development Centre, 1980. (In press).

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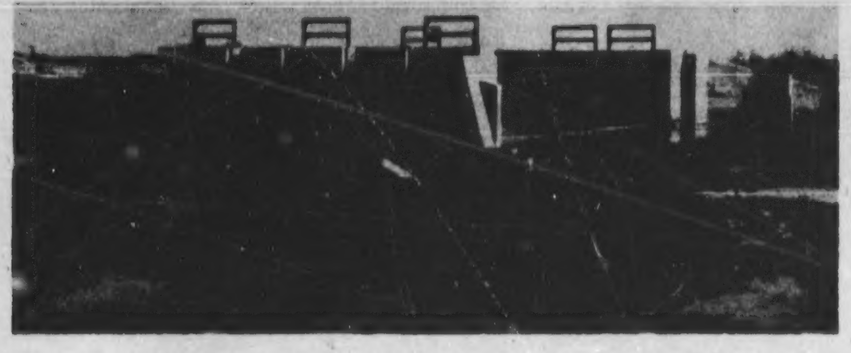
BANGLADESH

by A.H. Latif

National mandates

It was during the late 1960s that environmental problems in the region which is now Bangladesh received some attention. The importance of protection, preservation and conservation of the overall environment of this region was recognized by a limited circle of professional people and government functionaries. Their efforts resulted in the promulgation of the Water Pollution Control Ordinance of 1970, in order to provide for control, prevention and abatement of pollution of waters. The ordinance was later amended and the Water Pollution Control Act (WPC) was promulgated in 1973. Then a Water Pollution Control Project was organized in September 1973, under the Directorate of Public Health Engineering in the Ministry of Local Government, Rural Development and Co-operatives.[1]

In 1977, the Environmental Pollution Control (EPC) Ordinance was passed to provide for the control, prevention and abatement of pollution of the environment of Bangladesh. Under the provision of the ordinance, an Environment Pollution Control Board was constituted. The ordinance, among other things, provided a definition of environment in these words: "*environment* means the surroundings consisting of air, waters, soil, food and shelter which can support or influence the growth of life of an individual or group of individuals, including all kinds of flora and fauna."[2]

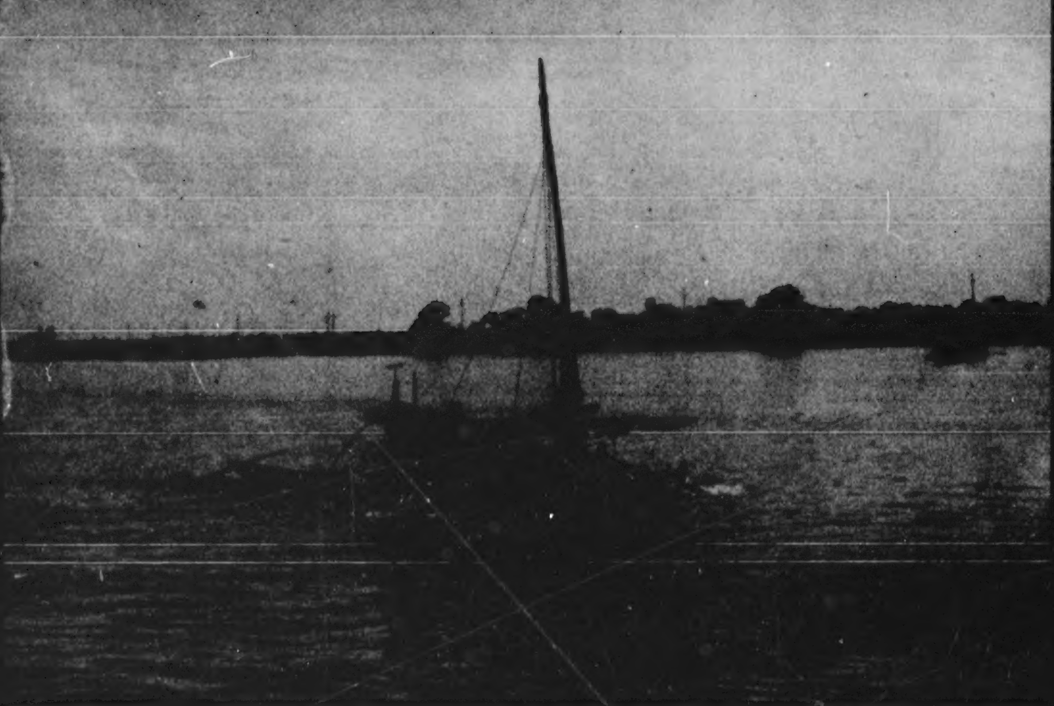


In areas such as forests, wildlife and mines, separate legislation has existed for a long time. These are: the Mines Act 1923, the Wildlife preservation Act, and the Forest Act, 1927. After independence, with necessary changes and amendments, the Bangladesh Wildlife (Preservation) Order, 1973, was issued. But these ordinances and orders, including the EPC ordinance, required updating in the light of recent national and international concern in these areas. For this purpose a draft for a proposed "National Environmental Protection Ordinance" has been prepared and is now under the consideration of the Government.[3]

Environmental problems and issues

A small country of 56,000 square miles, criss-crossed by mighty rivers with their innumerable tributaries, Bangladesh presently accommodates more than 90 million people.

The people of Bangladesh live close to environmental disasters. Cyclones and tidal bores are frequent visitors and flood is almost a normal feature in Bangladesh. About 70 per cent of the total population suffer from water-borne diseases. Only a very small percentage of the total population has access to pure drinking water, and sewerage systems are almost non-existent in rural areas of the country. Water in the ditches, small streams and stagnant zones is constantly being contaminated and is helping most of the pathogenic micro-organisms to survive and multiply. Industrial wastes, fertilizer, toxic chemicals and synthetic detergents are also responsible for water pollution in the country.



Because of the slow process of urbanization and industrialization, the pollution of air is not yet a serious problem in the country. Whatever pollution of the air there is in urban regions is due largely to industrial effluents, exhaust from mechanized vehicles, household kitchen fuels, brick works and a number of other pollutants of lesser threat.

In Bangladesh, the most serious environmental problem is desertification. It has been caused both by climatic factors and by man-made disturbances in the natural balance of the ecosystems. The damage done to the topography, to socio-economic dynamics and to agricultural systems by desertification gives great cause for alarm.

Major environmental actions

The environmental action programmes so far undertaken in Bangladesh are classified below.

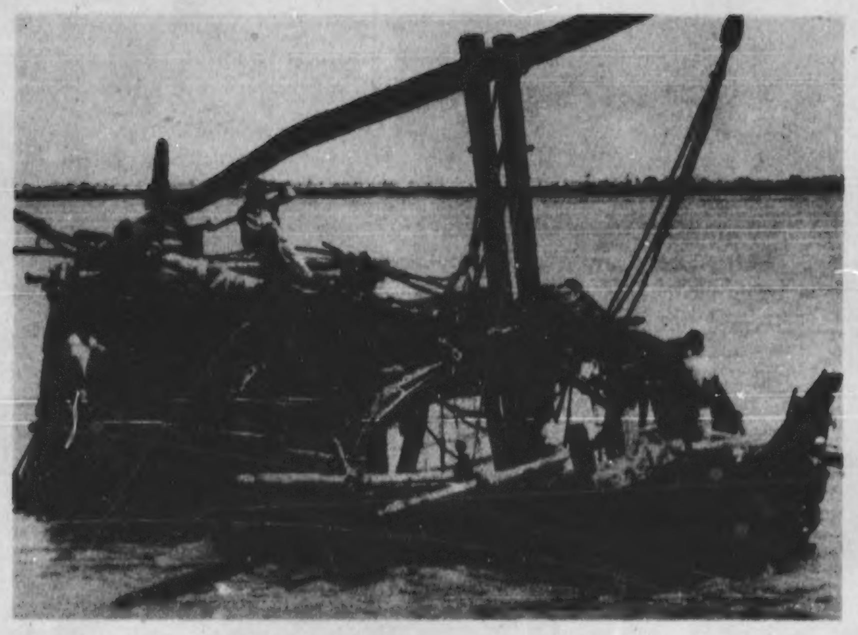
Water monitoring

1. Ten EPC monitoring stations to assess the nature and extent of pollution in the major rivers of Bangladesh are in operation since 1973.
2. Nine monitoring stations of the Global Environment Monitoring System (GEMS), including one at Kaptai Lake,is in operation since 1977.

3. Regular monitoring of tap water is conducted in major urban water supply systems to ascertain fitness for drinking, cooking and washing purposes.
4. Monitoring of ground water in specific selected locations takes place intermittently.
5. River water sample collections are made every month during high-flow periods and fortnightly in low-flow periods to determine the degree of contamination and to assess the suitability of the aquatic environment as a convenient habitat of fish and other aquatic organisms.
6. Water quality standards have been determined for drinking water, fishing water and for recreational water. The permissible concentrations of various toxic substances in water have been ascertained. These standards for Bangladesh have been published in a booklet.
7. The EPC Laboratory Division conducts tests and analyses regularly under controlled conditions to determine the nature and extent of pollution of various water types. Results are filed with relevant agencies for policy-devising and appraisal.
8. Liaison is carried out with the United Nations Environment Programme (UNEP) and International Register for Potentially Toxic Chemicals (IRPTC) in matters related to toxic chemicals.

Industrial pollution surveys

1. Detailed surveys of some important regions of industrial concentration have been completed; industrial zones in large urban areas have been surveyed through questionnaires to ascertain the nature and characteristics of the production process, of the inputs used, and of the air and liquid effluents.
2. The harmful constituents of the air and effluent discharge of some specific industries have been identified. The degrees of water pollution of some of the rivers due to industrial wastes have been ascertained.
3. Major polluting enterprises and factories have been compelled to install treatment plants and systems for their wastes.
4. Workable solutions to the pollution problem have been provided to industrial enterprises.
5. Proposed industrial enterprises and new plants require the prior approval of EPC before they are actually set up.
6. For every new enterprise, EPC makes an appraisal to assess the environmental impact of specific projects/industrial units.



7. A clearance is provided when it is found that the proposed enterprise does not pose a threat to the environment or imply any possibility of environmental degradation.
8. Advice, consultations and constructive recommendations are provided to individual entrepreneurs in matters pertaining to the preservation of the environment.

Automobile emission and noise

1. A two-phased programme of survey-cum-action is underway. The nature and extent of air pollution caused by automobile exhaust systems have been studied.
2. With the co-operation of Dacca Metropolitan Police (DMP), vehicles that were detected as violating pollution rules were penalized.
3. During 'Traffic Weeks' of the DMP, a thorough check is made of loud vehicle horns and black exhaust smoke from plying vehicles.
4. Violators are being told to properly keep up their vehicles and to see that the combustion process is total and not partial of the vehicle engines.

5. Posters have been placed at busy points of the city to make the travelling public aware of the health hazards and ill-effects of inhaling polluted air especially due to black smoke of automobiles.
6. Loud horns of vehicles can cause nervous problems in people, and hence the import of air-vacuum horns is being banned. About 70 per cent of the vehicles on the streets of Dacca during the survey were found to emit black smoke and use loud horns.
7. After successful completion of the survey programme at Dacca, similar programmes are being launched at Chittagong, Rajshahi and Khulna.

Air pollution

1. Studies are in progress to assess the constituents of the air emission from chimneys of major industrial units.
2. The Triple Superphosphate (TSP) plant at Chittagong was found to emit harmful gases from its chimneys; corrective action has been taken up on the initiative of EPC.
3. A number of industrial units have been apprised of the toxic nature of their gaseous emissions. Suggestive recommendations have been provided by EPC.

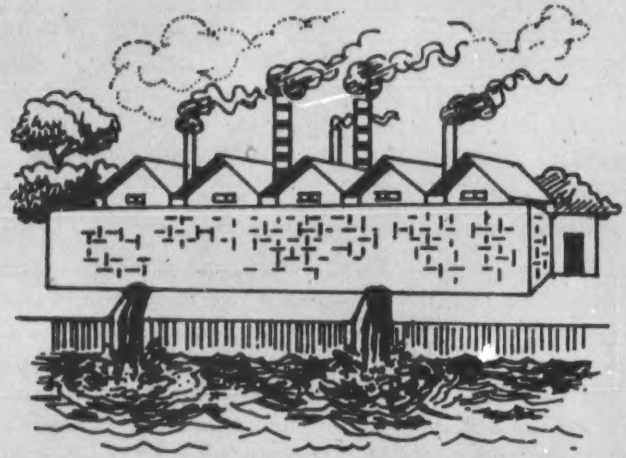
Energy

1. The EPC is continuing research on alternative sources on energy. Bio-gas technology is being developed and has been found to be a very popular alternate fuel. A demonstration pilot plant which can generate 200 cubic feet of bio-gas per day has been installed at Savar, near Dacca. Locally-available materials and indigenous techniques have been emphasized.
2. In areas yet to be electrified, the bio-gas lamp has been found to be very useful.
3. A public-awareness campaign was conducted by the EPC at an ideal-village of Noakhali district, to popularize bio-gas technology. Very encouraging response has been received.

Bio-assay experiments

1. The Laboratory Division of EPC has a separate *bio-assay* (biological testing) section to carry out experiments on popular fish species. These experiments are designed to ascertain the tolerability limits and survival conditions of different fish species in the presence of varying concentrations of pollutant chemicals. Bio-assay experiments conclude with an indication of safe-dosage levels of toxicants for specific fish species.

2. A flow-test machine has been designed and in operation in Dacca Laboratory to carry out assay tests in flowing-water conditions.
3. A study of the effects of varying concentrations of chrome, calcium hydroxide, ammonia and malathion of different types of fish has been conducted at the EPC Laboratory.



Public awareness programmes

1. Seminars, workshops and symposia are held at regular intervals.
2. Posters, containing diagrams, sketches and drawings with motivational slogans are placed at busy points.
3. Television and radio are conveying environmental messages.
4. Newspapers are printing catchy slogans and providing tips towards healthy living. A number of EPC publications are available.
5. A global environmental information network is in operation through the UNEP 'Infoterra' system.*

The government structure/machinery

The EPC Ordinance of 1977 provided for an Environmental Pollution Control Board with following powers and functions. The Board is to:

1. Formulate policies for the control, prevention and abatement of pollution of environment;
2. Suggest measures for the implementation of its policies;

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* **Infoterra: International Referral System for Sources of Environmental Information**

3. For the purpose of (1) above, the Board may: (a) require any person to furnish or cause to be furnished such information as it may specify; (b) call for a report from the director on the existing and potential problems of pollution of environment in the whole of Bangladesh or any part thereof; and (c) appoint such expert committee as it may consider necessary.

The EPC Cell: an executive implementation body. The Department of Environment Pollution Control (EPC) is the policy-implementation agency of the EPC Board. The Department is headed by a Director who is the executive head of the implementation cell and is responsible for implementation of projects duly approved by the Government and the policies formulated by the Board.

Curriculum development in environmental education

The Government of the People's Republic of Bangladesh constituted a National Curriculum and Syllabus Development Committee in 1975 for developing new curricula and syllabus for grades I-XII. The Committee completed its task and submitted its reports to the Government in due course. The Government has so far accorded approval for introduction of the new curricula in the school system up to tenth grade. Text-books written according to new curricula and published by the Text-Book Board have been introduced in the first six grades; the remaining classes are scheduled to be covered by 1982.

First level. The new curricula for the first level include a subject entitled 'Environment Learning'. In introducing the subject, the Curriculum Committee rationalizes its inclusion in the curricula in these words:

> *The children of this age group (first level) are inquisitive, imaginative and creative by nature. Because of these natural instincts, they want to know the environment, they want explanation of whatever seems to them new in the environment. Keeping in view the psychological principles, mental and other characteristics of children of this age group and for their harmonious development, a subject in the name of 'Environment Learning' is being introduced in grades I and II for the first time. Basic Science and Social Science as two different subjects will be integrated and replaced by this new subject. Environment Learning is being introduced with these objectives: the children will be able to expand their experiences and sharpen their analytical power through observation of the environment. In addition to a detailed syllabus, suggested teaching aids, teachers' activities and students' activities have been identified for this purpose. The content headings of the syllabus for this subject are: family environment; food, clothing,*

> *and shelter for the family; different types of houses in the local community; domesticated animals and birds; concepts related to direction, time, distance, light, climate and seasons; environment of the school; social environment of village and the professions of the people in the locality; local communication system; local history; importance of clear and clean environment; recreation during leisure; observation of local environment and its natural characteristics.*

The Curriculum Committee suggested that there would be no separate book for this subject; a teacher's guide would be the main aid for teaching the subject.[5]

For grades III, IV and V, the subject is divided into two separate subjects, Environment Learning (Social) and Environment Learning (Science). It has been stated in the Curriculum Committee Report that the experiences of students gained in grades I and II Environment Learning would be further expanded and strengthened in grades III, IV and V through acquiring knowledge and understanding of the elements of the social environment and the characteristics and influences of animate and inanimate objects. The content of Environment Learning (Social) for these classes will be drawn from Civics, Geography, History and Economics. The content of Environment Learning (Science) will be drawn from Physical Geography, Zoology, Agriculture, Physics, Chemistry and Health and Nutrition. Provision of separate textbooks for these two subjects for grades III, IV and V has been made and *participation of students* in practical work is emphasized.[6]

Population education has been integrated into selected subjects of grades IV and V under the overall programme of introduction of population education in the school system of the country. 'Population and environment' as a topic has been integrated into Science of grade IV.

Second level of education

The first-level 'Environment Learning' is not a subject for the second level but the Curriculum Committee in its report stressed that subjects like Science and Social Science for this level would reflect concepts and contents from nature and environment-related areas.

Population education curricula for the second level include certain environment-related topics such as: population and environment, population growth and natural environment, nature and human society, population and environment (soil, water and air). These topics are integrated in Science subjects of different classes.

One of the faculty members of the Institute of Education and Research, University of Dacca, has recently completed his doctoral thesis in environmental education. Taking ecology as a base, the researcher has attempted to infuse the relevant ecology materials for developing the desired environmental knowledge and attitudes. The researcher claims that the uniqueness of this study lies in a 'single-subject infusion approach' to the development of 'environmental literacy' among secondary school students.[7] This approach may be adopted, at least in part.

References

1. Government of Bangladesh, Ministry of L.R., L.G., R.D. and Co-operatives, DPHE, Water Pollution Control Project, *Yearbook Water Pollution Control Project (September 1973 to June 1975).* Dacca, January 1976.

2. _______, Ministry of Law and Parliamentary Affairs, *Notification (Dacca, the 5th April 1977).* Published in the Bangladesh Gazette (extraordinary), Wednesday, 6 April 1977.

3. Government of Bangladesh, Environment Pollution Control, *A resumé of environment pollution control in Bangladesh,* Dacca, June 1980. *Note:* The editors have been unable to learn whether this important measure has been passed.

4. Bangladesh National Curriculum and Syllabus Committee, *Report, First Part: First Level,* December 1976.

5. Ibid.

6. Muttaqi, Md. Iqbal Aziz, *Development of a Curriculum in Ecology for Secondary Schools of Bangladesh* (unpublished doctoral thesis), 1980.

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CHINA

by Chen Yiqiu

Introduction

There are conventionally two kinds of environmental education in China. One is for the preservation of nature (environmental conservation), the other is for pollution control (environmental protection). Both of them are for the training of specialists.

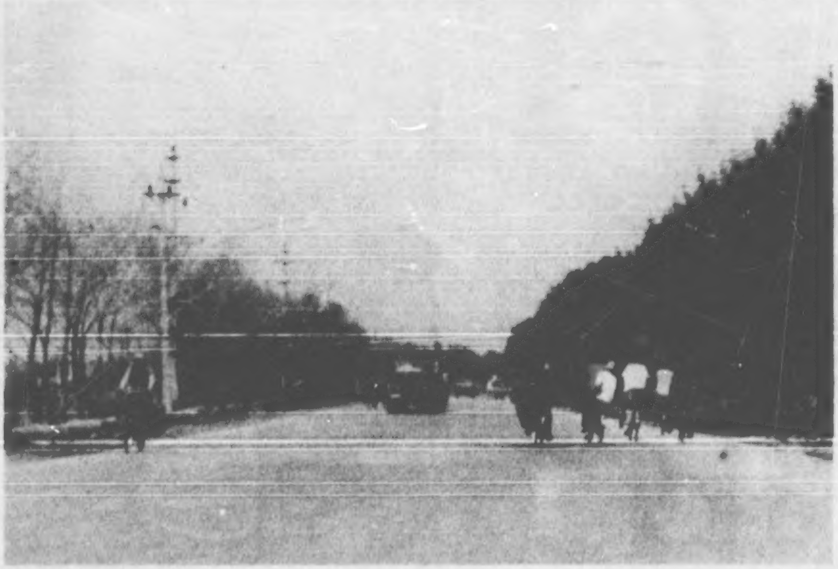
A new discipline is now emerging along with the growing up of the comprehensive or holistic concept of 'environment'. This discipline is termed environmental sciences in China; it should grow into environmental science and finally into environmentology. They are multidisciplinary (environmental sciences) to interdisciplinary (environmental science) in nature, with environmentology as a unique discipline, comparable with classical disciplines like chemistry, physics and mathematics.

"The so-called environment must have something as its centre. In environmental protection, the centre is man, and the environment is all

the entities surrounding the man."[1] The environmental sciences, environmental science or environmentology all form a science which deals with the interrelationship between man and his environment.

It regards growth of population (development of man himself) and growth of the economy (development of material production for sustaining and improving man's quality of life) as stimuli to the environment, on the one hand, and regards the change of environmental resources (such as land resources, mineral resources, fresh water, clean air, scenery, or pollution-sustaining capability) as response of the environment, on the other hand.

Man's effort (environmental protection, conservation, preservation or management) is how to manage the growth of population and economy under the constraints of environmental resources, so that the development and the environment will be kept in harmonic balance. The balance is dynamic in nature. The population and economy are growing, while environmental productivity is also increasing with the development of technology. But the rise of the environmental productivity or environmental 'bearing' capacity under a given period of time and space is finite



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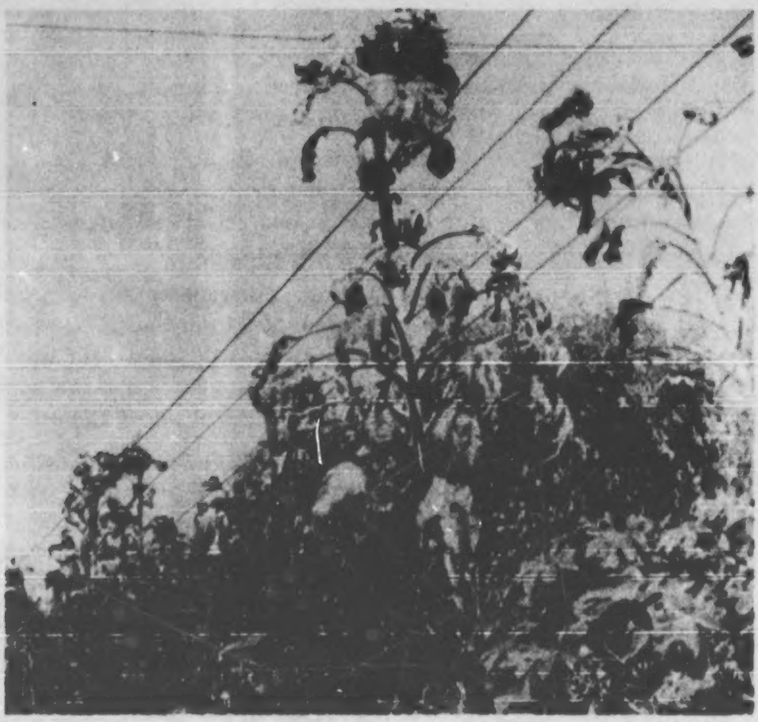
[1] *Principles of environmental science,* edited by Liu Peitung and Chen Yiqiu [n.p.] Water Conservancy Publishing House. (In press).



in nature. The growth of population and economy should in no way overshoot the increase in environmental productivity. The environment should be preserved and enhanced not just for the welfare of the present generation, but for the good of all future generations.

Most of the environmental problems and issues now arising in China are the result of environmental illiteracy. There exists an urgent need to disseminate concepts of environment to all, from policy-makers (including specialists as well) to the general public, in and out of school, and from short-term training to life-long learning. This is the task of a new environmental education.

We can say thus that there exist three kinds of environmental education. The first two, conventional environmental *conservation* education and environmental *protection* education, which are mainly for the training of specialists in various technical fields, should be very much strengthened. The above outlined new environmental education, which may be termed *environmental science* education, is now growing vigorously and will be described herein.

Environmental policy

The Constitution of the People's Republic of China states in Article 11 that, "The State protects the environment and natural resources, and prevents and eliminates pollution and other public harms."

In February 1979, the government published a set of Regulations Regarding the Breeding and Protection of Water Resources. In that same month a tentative Law of Forestry was passed. And in September 1979, a tentative Environmental Protection Law was passed.

This is the first overall law concerning environmental protection in China. It defines the environment to include "atmosphere, water, land, mineral deposits, forests, grassland, wild animals, wild plants, aquatic lives, famous spots and historic sites, scenic spots for sightseeing, hot springs, health resorts, nature conservation areas, residential districts and other."

The law deals with two major kinds of environmental problems: the destruction of natural resources, and environmental pollution and other public damage. It aims "to ensure, during the construction of a modernized social state, rational use of the natural environment, and prevention and elimination of environmental pollution and damage to ecosystems, in order to create a clean and favourable living and working environment, protect the health of the people and promote economic development."

The Environmental Protection Law outlines the working guideline of environmental protection: "Overall planning, rational layout, comprehensive utilization, conversion of harm into good, and reliance upon the masses, with everybody taking part in the protection of environment, for the benefit of the people." It requires that, "In planning new construction, reconstruction and extension projects, an environmental impact report must be submitted for examination, and the designing work started only after approval of the report by the Environmental Protection Agency and other relevant agencies."

The law further stipulates that, "The installations for the prevention and elimination of pollution and other public damage should be designed, built and put into operation at the same time with the project proper... Those enterprises which have caused pollution and other public damage must, according to the principle of 'whoever causes pollution shall be responsible for its elimination', make plans to clear it up or, alternatively, submit plans to the competent authorities for approval either to change their direction of production or to move to some other place ."

It stipulates the establishment of an environmental protection organization in the State (national) Council; environmental protection bureaux in provinces, autonomous regions, and municipalities directly under the

Central Government; environmental protection organizations in municipalities, autonomous prefectures, counties and autonomous counties according to their necessity; environmental protection organizations in relevant agencies (ministries) of the State Council and in local people's government at all levels; environmental protection organizations in large and medium-scale enterprises and relevant institutions according to their necessity.

It also puts forward in addition to the principles cited above, those of 'civilized production', taxation for pollution discharge, adjustment, conversion and removal of polluting enterprises and institutions, and development of non-polluting or less polluting technology, techniques, products and energy sources.

Major environmental problems and issues

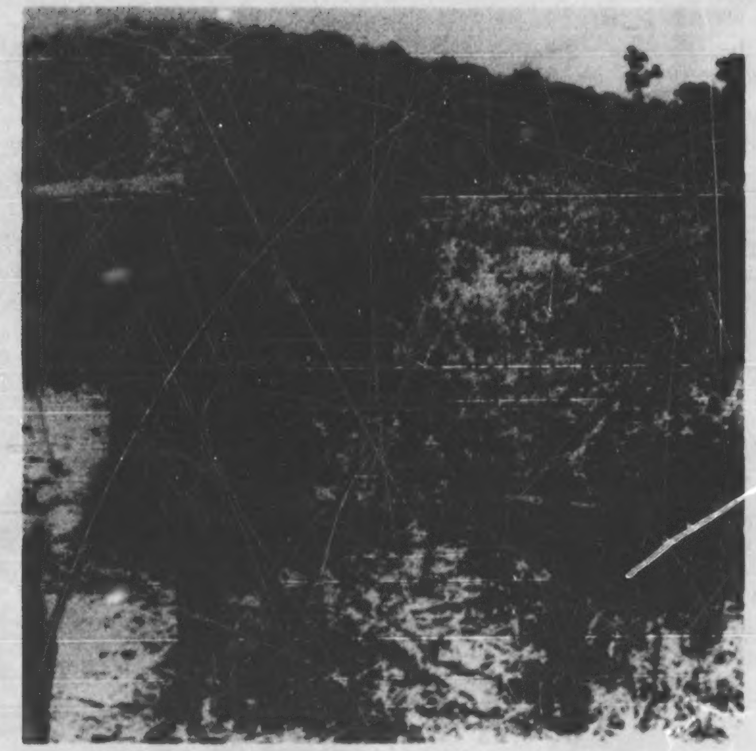
The environmental problems and issues with which the country is now most seriously concerned are those related to population growth, economic development and the utilization of natural resources.

Urban environment. The urban population has doubled in the past 30 years. Owing to the concentration of population and industry in urban areas, there occur air pollution, water pollution, noise, vibration, wastage and other public damage. For example, the Suzhou Municipality of Jiangsu Province is world famous for its scenic beauty. There is an old saying, "There is paradise above, and Suzhou and Hangzhou below."

In the past 30 years, however, its gross value of industrial production has been increased 40 times. Four hundred seventy-eight factories have been established on its 27.6 square kilometres of urban area, with an average of 17.5 factories on each square kilometre. The urban area is now encircled by 20 chemical plants from outside, with three paper mills occupying the upper reaches of its supplying river streams, and 10 printing and dyeing mills and 42 electroplating plants scattered throughout the urban area. Factories are interwoven with the residential districts, guest houses and scenic gardens, while stacks are standing side-by-side with ancient pagodas.

Land resources. In the past 30 years, vast stretches of forests have been destroyed and grassland exploited in order to expand arable lands. Meanwhile, a large amount of cultivated land has been occupied through urbanization and industrialization. During the past 20 years, the cultivated land thus occupied amounted to 1.7 million hectares each year. The total amount of cultivated land in China is now about the same as that in 1949. But due to the growth of population, the cultivated land per capita has declined to .10 per hectare as compared with .18 in 1949–slightly more than half the previous proportion.

Forests and grassland. The forest coverage rate of China is only about half that of the world average. It is now undergoing further decline. For example, the Sichuan Province is known as a 'land of abundance'. The weather has undergone great changes due to deforestation. The occurrence of spring drought in Sichuan has now become eight in ten years, as compared with once out of three years in the 1950s. There are 40 counties having their annual precipitation reduced by from 15 to 20 per cent. The soil erosion in some places of Sichuan is so heavy that the Yangtze River threatens to become another Yellow River, which is world famous for its high silt loading. Although there are 200 million hectares of grassland in China, the per-capita figure is not high as compared with



other countries. Again, the total amount is gradually decreasing due to deforestation and desertification.

Water resources. There are 27 major rivers, including the Yangtze, Yellow, Huai, Xiangjang, Pearl and Songhuajiang, that have been polluted in varying degrees. There are 41 major municipalities, including Shenyang, Xian, Baotuo, Taiyuan and Beijing, which have their groundwater polluted seriously. As in other parts of this and other regions, many municipalities have their groundwater level descending perpetually due to overdrafting.

Major environmental actions

The late Premier Chou En-lai had paid much attention to protection of the environment: the above-mentioned working guideline of environmental protection was originally drafted by him. Owing to the interference of the 'Gang of Four', however, China had taken the roundabout way of the developed countries in environmental protection: 'first polluting and then trying to eliminate it'. Only in recent years, has the country begun to take serious action to preserve the environment.

Environmental legislation. Laws concerning environmental protection have been passed by the Standing Committee of the National People's Congress, mainly in 1979. This is a great change following the shift from 'rule by man' to 'rule by law'. These laws will be further supplemented by various regulations.

Environmental organization. In 1974, there was established in the State Council a Leading Group on Environmental Protection and its executive body–Environmental Protection Office (EPO). This Leading Group is chaired by vice-premiers, with ministers or vice-ministers of relevant ministries as its membership. By 1978, environmental protection agencies had been established in all the provinces, municipalities and autonomous regions, in the relevant ministries of the State Council, in many of the large cities and in large and medium industrial and mining enterprises. Since the enactment of the Environmental Protection Law, the environmental protection organization has been further expanded and strengthened.

Environmental management. The concept of environmental protection has been turned from solely the control of 'three wastes' (waste air, waste water and waste slag) to the comprehensive management of the environment. Taxation on waste discharge, a penalty for pollution, and a system of environmental impact assessment have been put into trial implementation.

For example, the South-to-North Water Project, which pumps a discharge of 1,000 cms at Yangzhou in Jiangsu Province from the Yangtze River to supply water to the Tianjin Municipality and eastern Hebei Province through the existing Grand Canal, has been suspended due to its serious impact on the natural environment.

The construction of the Eastern Chemical Plant in Beijing has been decided recently to 'dismount from horse-back', although 20 million yuan (approx. 13.8 million US dollars) have already been invested. One of the major considerations is its serious impacts upon the environment.

Environmental education. The conventional environmental education for the training of specialists in nature preservation and pollution control has been strengthened, especially the latter part. There are now more than 30 environmental protection departments and faculties in various colleges and universities. Two environmental protection technical schools (middle schools), one in Changsha, Hunan Province, and one in Canton, Guangdong Province, have been established.

A new environmental science education is now under trial implementation. For school education, the Beijing National University has initiated a pilot education programme for training teachers to teach environmental science. Experiments on teaching environmental science in middle school, primary school and kindergarten are now in progress. For out-of-school education, short-term training courses for in-service environmental cadres are in progress.

Pilot environmental science education programme

Beijing Normal University is a university for training pre-service and in-service teachers. Its Department of Geography initiated in 1978 a three-year pilot programme aiming at:

1. Training post-graduates for teachers to teach environmental science in other colleges and universities;
2. Training in-service teachers of other normal colleges and universities to teach environmental science;
3. Integrating or developing environmental science; and
4. Developing instructional materials.

Post-graduate training. The integration of environmental science is achieved through four stages:

1. **Trainee.** The enrolled post-graduates have a wide variety of backgrounds–geography, chemistry, mathematics, automatic control, hydraulic engineering. Further, they have all been engaged in practical work for several years.

2. **Courses.** There are five required courses:

    a) Dialectics of nature
    b) Foreign languages
    c) Introduction to environmental geoscience
    d) Principles of environmental science, and
    e) Principles of environmental monitoring.

These are supplemented by the following selective courses: (a) Environmental mathematics, (b) Large-system theory, (c) Modern control theory, (d) Biochemistry, (e) Water chemistry, (f) Electrochemistry, and (g) Mathematical modelling of water environmental systems. The courses of Dialectics, Large-system theory, Modern control theory and Environmental mathematics have the aim of providing the graduate student with modern methodology for integration.

In the course of Principles of environmental science, Chapter 1, the Introduction, emphasizes that, (1) Environmental science is devoted to manipulation of the inter-relationship between man and his environment; (2) it is important to solve the contradictions between economic development and environmental protection; (3) we must avoid the detours of the industrialized countries of being polluted first and then trying to get rid of the pollution.

Chapters 2,3,4 and 6 are devoted to air, water, soil and noise pollution respectively, and their prevention and control. Chapter 5 describes the pollution of living organisms. In these chapters, the mechanisms of pollutants and their effects on the human body are described.

Chapter 7 concerns the *evaluation* of environmental qualities.

Chapter 8, Environmental management, emphasizes the comprehensiveness, regionality and self-adaptiveness of environmental issues. It consists of environmental legislation, environmental organization, theory of development, environmental economy, environmental planning and environmental impact assessment.

The issue of man and his environment, the natural sciences and the social sciences are thus integrated into one comprehensive unity.

3. **Trainer.** For the training of environmental post-graduates, a Co-operation Board consisting of various colleges and universities has been established. The courses of Principles of environmental science and Principles of environmental monitoring are taught by teachers from many colleges and universities. For example, the course Principles of Environmental science (total 150 periods) has been taught by 15 teachers and experts from ten universities, colleges and research institutes, namely Beijing Normal University, Beijing University, Nanjing University, Zhongshan University, Huadong College of Water Conservation, Zhejiang University of Agronomy, Beijing College of Forestry, Tongji University, Beijing University of Technology, and Beijing Research Institute on Environmental Protection.

4. **Interdisciplinary team-work.** The graduate students are now participating in solving practical environmental problems such as, for instance,

the environmental impact assessment of Yongping Copper Mine, an evaluation of the environmental capacity of the Songhuajiang and Tumunjiang Rivers, and the environmental planning of Beijing Municipality.

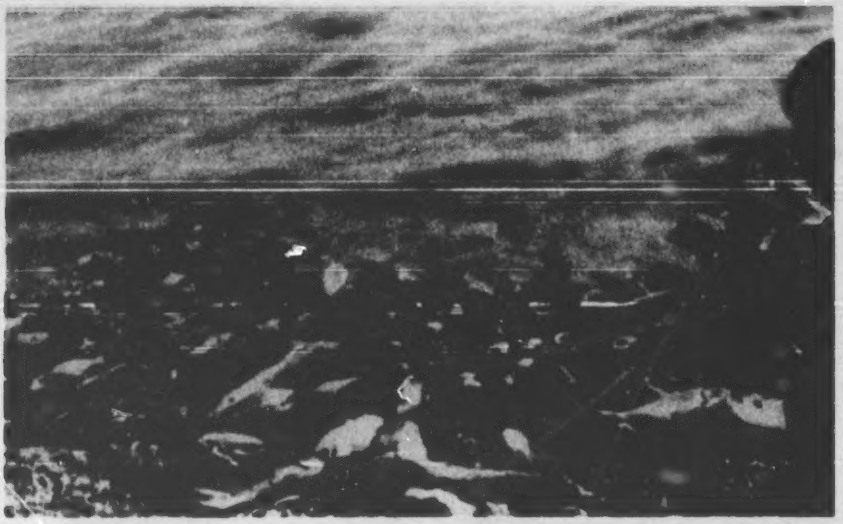
In-service teacher training. Twenty teachers of 'normal' (teacher) colleges and universities of various provinces and municipalities were first enrolled. They attended two post-graduate courses (Principles of environmental sciences and Principles of environmental monitoring).

These teachers have written in collaboration instructional materials on environmental science suited for normal colleges and universities during their study at Beijing Normal University. They are now teaching courses in environmental science at their own colleges and universities, in order to train teachers to teach environmental geoscience in middle schools.

Environmental education experiments

Experiments on teaching environmental science in middle school, primary school and kindergarten are now in progress.

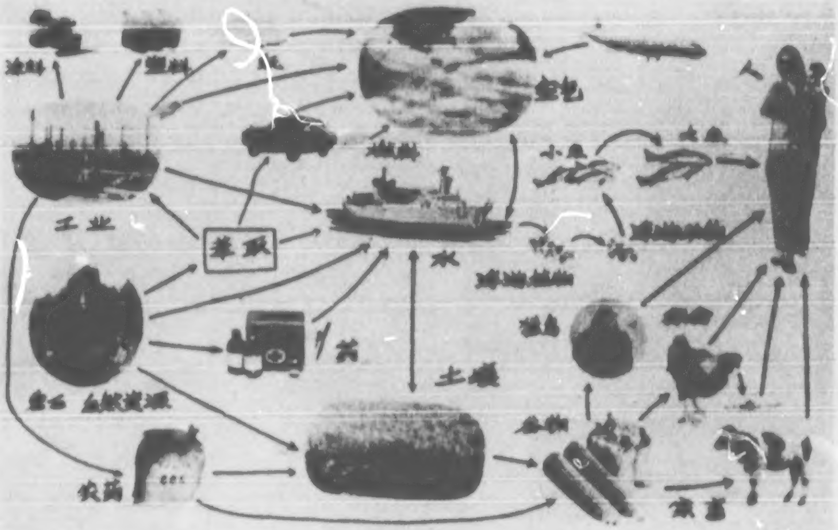
Middle school. The Education Bureau of Tianjin Municipality organized this year an environmental science training course for middle school biology teachers, and edited relevant instructional materials. Dongfanghong Middle School was selected to do the experiment. In the course of biology of the junior middle school, the theme 'inter-relationships between man and the environment' was added to the subject Living organisms and the environment.



Primary school. Experiments in teaching environmental science are now being conducted in the Pilot Primary School of Beijing Normal University. In primary schools of China, there exists in different grades a course called General Knowledge which includes topics like animals, plants, micro-organisms, physical geography and personal hygiene. This school is now trying to integrate topics such as 'environment', 'environment and ecological balance', 'environment and health' and 'environmental protection' in the course of General Knowledge.

Further, the pupils are participating in afforesting and beautifying the campus, and monitoring the air, water and noise pollution there.

Kindergarten. The Pilot Kindergarten of the Gansu Normal University is now conducting an experiment on teaching environmental science. It consists of the following topics: earth, day and night, climate, living environment, environmental sanitation, air, air pollution and its control, water, water pollution and its control, soil and plants, noise and music, natural environment and community environment and personal hygiene.



Non-formal environmental science education

There are two kinds of non-formal environmental science education in China, one for leading cadres (decision-makers) and one for the general public.

Cadres. For the modernization of the State, various training courses are being held for cadres at all levels. Environmental Science is one of the subjects. For example, the leading cadres of the Secretariat at the Central Committee of the Chinese Communist Party and the leading cadres of the State Council are now inviting scientists to give lectures. Among the ten lectures, the topic of the seventh lecture is "Modernization and environmental protection."

The State Council and the Environmental Education Committee (Chaired by Prof. Liu Peitung, Beijing Normal University) of the Chinese Society of Environmental Sciences are now jointly organizing short-term training courses for leading cadres in environmental protection. For example, the first course, held in September 1979, was attended by 130 leading cadres working in environmental management, environmental monitoring and scientific research fields from Heilongjiang, Jilin and Liaoning provinces, Tianjin Municipality, and the Army. The teachers came from Beijing Normal University; Beijing University of Technology; Qinghua University; Beijing University; Nanjing University; Liaoning University; Research Institute on Acoustics of the Chinese Academy of Sciences; Research Institute on Architecture of the Ministry of Metallurgy; Chinese Academy of Medical Sciences; Beijing Medical College; Shanghai Academy of Social Sciences; the Beijing, Tianjin and Shenyang Research Institutes on Environmental Protection; Beijing Environmental Monitoring Centre, and the EPO.

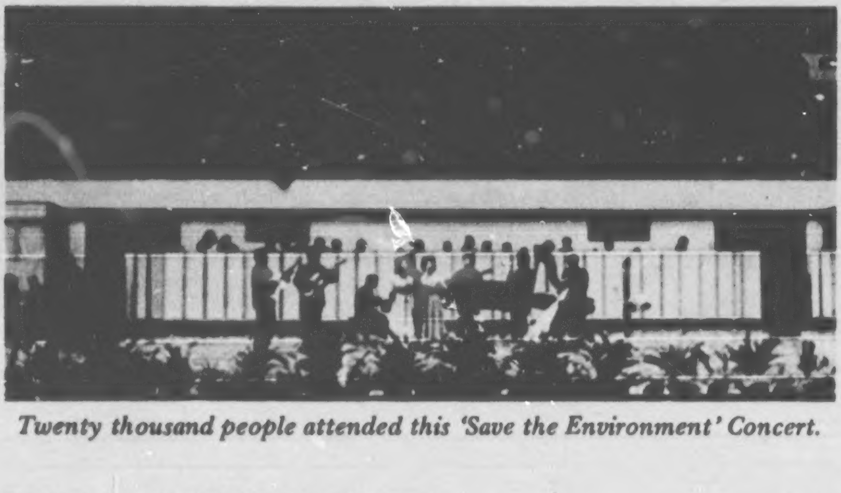
The teaching programme of the short-term training course for the environmental leading cadres covers the following topics: environment, ecosystem, polluting sources, air pollution and its control, water pollution and its control, land resources and their management, noise pollution and its control, environmental protection and human health, environmental legislation, environmental standards, environmental quality assessment, environmental monitoring, environmental economy and environmental management.

General public. The mass media have a tremendous job to do in disseminating environmental knowledge to the general public. There are now more than 50 periodicals and magazines on environmental protection and

Part of a sequence from Voice of the environment

environmental science. The *Journal of Environmental Protection,* edited by the Beijing Research Institute on Environmental Protection, has a circulation of some 70,000. The fortnightly newspaper *Voice of the Environment* published by the Chinese Researchers' Association on Environmental Sciences now has a circulation of more than 400,000.

In March and April 1980, in accordance with a decision of the Ministry of Propaganda there was launched throughout the country an environment movement: Environmental Protection Propaganda Month. All the major newspapers, broadcast stations and TV stations participated in publishing editorials and commentators' essays, and in disseminating information about the environment.



Twenty thousand people attended this 'Save the Environment' Concert.

Environmental education management

In the Central Government, there are the Ministry of Education and the EPO responsible for overall environmental education. The other

relevant ministries also have bureaux of education and bureaux of environmental protection responsible for environmental education in their own subordinate colleges and universities.

In the provinces, municipalities and autonomous regions, there are also bureaux of education and bureaux of environmental protection responsible for environmental education.

There are two non-governmental organizations involved in environmental education. The one is the Chinese Society of Environmental Sciences, which is chaired by the Director of the EPO. Under the Society, there are committees—an Environmental Education Committee responsible for in-school education, and an Environmental Propaganda Committee responsible for non-formal education. The other is the Chinese Researchers' Association on Environmental Sciences, which is also taking an active part in disseminating environmental knowledge.

Recommendations

The above-mentioned Environmental Education Committee held in December 1979 its first conference. This conference made to the EPO and the Ministry of Education the following recommendations.

Organization. It was first recommended that a special organ be established in the Ministry of Education to manage environmental education.

Next it was suggested that a Department of Education be set up in the EPO:

1. For making overall plans regarding the establishment and distribution of environmental specialities in colleges, universities and technical schools, and
2. To manage the in-service education of cadres and technical personnel.

The relevant ministries are responsible for training technical personnel according to their own necessity in accordance with the overall plan.

Higher education. In comprehensive universities subordinate to the Ministry of Education, it was recommended that specialities of comprehensive management, ecology and environmental science (or human ecology) be established.

Further, it was proposed to:

- Increase specialities of environmental engineering, both general in nature and more specialized (for metallurgy, chemical engineering and light industry).
- Increase specialities of environmental and monitoring analysis.
- In colleges and universities of medical sciences, agronomy and forestry, establish specialities of environmental protection.
- Train post-graduates for establishing specialities of environmental management, environmental economy and environmental legislation.
- For all specialities of engineering colleges and universities, add a course of 'Principles of environmental protection'. For specialities of sciences, agronomy and forestry and relevant specialities of economy, add a course of 'Principles of Environmental Science'.

Middle school and primary school. For these stages it was proposed to: teach environmental science in middle school, middle technical school, primary school and kindergarten; extend senior middle schooling to three

years (now two years), increase the periods for biology and add a course of 'Environmental geoscience'. In junior middle school, the proposal was to increase the periods for biology and geography and to add topics like ecology and the natural environment.

Further, it was proposed to organize short-term teacher training courses in Beijing or Shanghai, and meanwhile to entrust Beijing Normal University with the training of teachers for normal colleges of various provinces and municipalities, which will in turn train teachers to teach environmental geoscience in middle schools.

In-service environmental cadres and technical personnel. It was recommended that training centres for in-service environmental cadres and technical personnel, both nation-wide and provincial, be established in order to train one round of all of them within three years.

Instructional materials. On the basis of the above-mentioned training courses for in-service environmental cadres and the Pilot Environmental Science Education Programme of Beijing Normal University, it was proposed to publish instructional material 'Principles of Environmental Protection' and 'Principles of Environmental Science'. □

Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
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INDIA

by B.D. Atreya

National mandates

The Scientific Policy Resolution of the Government of India lays emphasis on the effective combination of technology, raw materials and capital as the key to national prosperity. Of these, technology is perhaps the most important since it can make up, to some extent, the deficiency in the other two factors.

The wealth and prosperity of a nation depends on the effective utilization of human and material resources through industrialization based on science and technology. Rapid industrial and agricultural development thought vital for providing the basic needs of food, shelter, and clothing to millions in the developing countries entails much impact on the environment of the countries concerned. Our wisdom lies in keeping a wise balance between these two contradictory factors.

Major environmental problems and issues

Macro level. Some people believe that all developmental activities, depending as they do on vast exploitation of natural resources, would invariably result in natural and man-made disasters that face man today. This need not necessarily be so. While development is necessary to meet basic minimum needs of the growing population, one should bear in mind 'the carrying capacity' of the environment as to be the limits of all development activities. Much wisdom is however needed to keep the judicious balance.

Micro level. The Gandhi Peace Foundation Environment Cell brings out a newsletter, 'Environment', to draw the public attention to environmental problems. Some environmental problems highlighted in several recent issues are the following:

1. Silent Valley Hydro-electric Project which threatens to destroy the ecology of the tropical rain forest in Kerala, built up over thousands of years of evolution.
2. Air pollution has crossed the safety limit at Chembur and Lalbang in Greater Bombay.

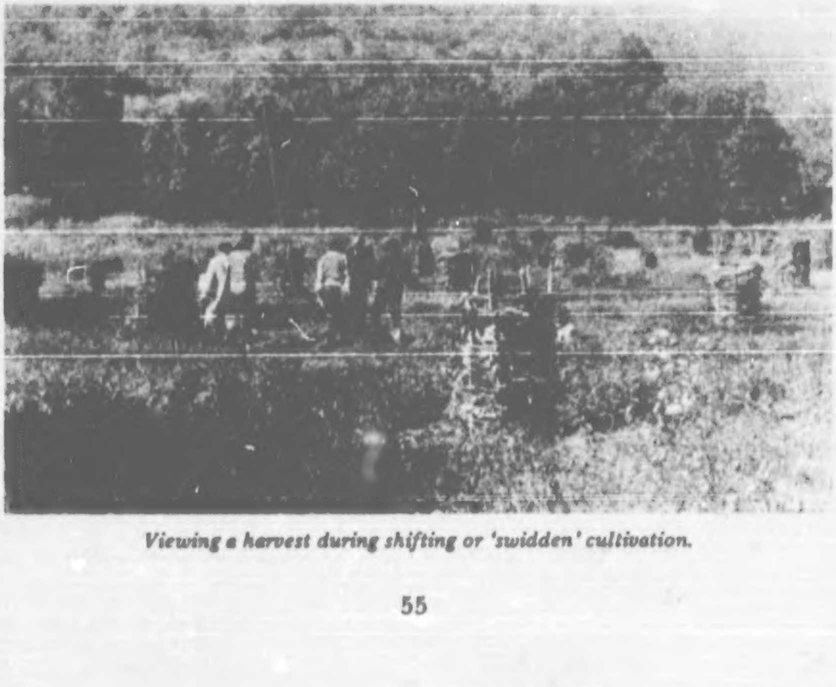
3. Nainital Lake may dry up in 90 years if the present rate of silting is not arrested.
4. The sewage threat to major rivers is growing at an alarming pace.
5. Pollution has become class-conscious in the village Sarini. The chimney smoke, because of prevailing wind direction, attacks only the poor and deprived.
6. Drying forests—the threat continues to increase because of emphasis on rural development and indiscriminate felling of trees.

Global ecology. Action by other countries does affect our country in many ways. We are all inhabitants of the Space Ship Earth. The global ecology that is fast deteriorating due to unrestrained mechanization which began in the industrialized West is likely to bring disaster to all of us fairly soon if wisdom and farsightedness fail to dawn even now. Playing with global ecology is by-and-large due to activities of the super-technology-based development nations.

Major environment actions

General initiatives:

1. In 1972 the Government, after playing a prominent role in the UN Conference on Environment at Stockholm, set up a National



Viewing a harvest during shifting or 'swidden' cultivation.

Committee on Environmental Planning and Co-ordination (NCEPC). This apex body at the national level identifies important problems and seeks their solutions, and reviews policies and programmes. It has also funded a number of research projects on environmental preservation and biosphere studies.

2. In 1974, the Government passed a law for the prevention and control of water pollution and set up a Central Water Pollution Board.
3. Environmental Boards have also been set up in every State with the Chief Minister of the State as Chairman.
4. At the Centre an Environmental Information Service has been set up to collect information related to environmental matters from all parts of the country.
5. A separate Department of Environment has been set up by the Government of India recently, to co-ordinate the activities and advise the Government on environmental matters.

Non-official efforts. The National Environmental Engineering Research Institute (NEERI), Nagpur, has kept a constant vigil on air pollution in large cities and industrial centres.

People's initiative. There has been an appreciable spread of environmental awareness among the people. In 1973, in the hill district of Chamoli, Uttar Pradesh, for instance, the village people started the 'Chipko' movement for protection of the forests. The movement is preventing the felling of trees in some areas and in others it is engaged in reforestation.

Definition, scope and role of environmental education

The environment of an individual comprises all the physical and social factors around him which directly or indirectly affect his living—including working conditions. The various environmental factors are interwoven with each other and in terms of their effects on the people and other living beings. The physical environment includes the living and nonliving, the geographical landmarks, topography and climatic conditions, the man-made features such as buildings, roads, bridges and modes of transport, and other features like health, nutrition and sanitation aspects. The social environment consists of the family, community life, festivals, community helpers' mode of production, and procurement and supply of essential commodities. It also constitutes socially-acceptable habits and attitudes for effective living and functioning in a society.

In the context of the above concept of environment, environmental education in India may be seen as having three strands:

A scene from the NCERT film, Learning through the environment, *depicting potential of the social environment for organizing learning situations.*

– education *for* the environment
– education *about* the environment
– education *through* the environment

While not mutually exclusive, the strands are useful for describing where the emphasis lies.

At the primary level (grades I-IV/V) Environmental Studies (Social Studies, Nature Study and Health Education) is one of the five prescribed areas of the curriculum (others being: one language, mathematics, socially useful productive work, and games and creative activities such as music, dancing and painting). It gets a 20-per-cent allocation.

At the middle level (grades V/VI-VII/VIII) environmental studies or environmental education is not prescribed as a subject. But 'Science—an integrated course' is heavily based on the use of pupils' day-to-day observations in the environment, and comprises topics like: man's dependence on plants and animals, and the balance of nature, population and pollution. Fair attention is thus given to the environmental aspect in the treatment of the subject Integrated Science' which gets 4 hours per week out of a total of 32 hours per week.

At the secondary level, the subject of Science receives 5 hours per week (both theory and practicals) out of a total time allocation of 32 hours per week. The inclusion of such topics of social relevance as Ecosystem, Biosphere, Ecological crisis, Conservation of natural resources, and Conservation of nature–national and international efforts, in the Biological Sciences course, points to the concern for social relevance that has influenced curriculum development work.

Environmental education is also a subject taught in non-formal education programmes launched by the Government of India as an experimental project for children of the 9-14-years age group who have either not completed primary education or have not gone to school at all for any reason. Here the emphasis is on the development of competencies needed to solve problems of day-to-day life.

Objectives and concept maps

The National Council of Educational Research and Training (NCERT) developed the guidelines for the school curriculum on the basis of the Report of the Indian Education Commission, and published them as the 'Curriculum for the ten-year school–a framework.' This document provided objectives for each stage and discipline for the ten-year schooling, along with ideas on teaching/learning methodology, evaluation, time distribution and other. With regard to primary education, there was broad agreement between recommendations of the 'Framework' and the Report of the Review Committee constituted to review the curriculum for the Ten-Year School.

Primary stage. According to these documents, 'Environmental Studies' has been identified as an important area of study for accomplishing many objectives of the primary stage of schooling. These are:

1. Acquisition of tools of formal learning, namely literacy, numeracy and technocracy;
2. Acquisition of knowledge through observation and experimentation about the social and physical environment;
3. Development of the ability to plan and execute some socially useful productive work;
4. Development of social responsibility, team spirit, and habits of co-operative behaviour within the family and the community;
5. Development of aesthetic perception; and
6. Nurturing of the child's innate creativity and curiosity.

All the above objectives are to be achieved through the content, the teaching/learning methodology and the co-curricular as well as extracurricular activities in the school.

A scene from DESM/NCERT tape/slide sequences. Children are learning the science process of 'classification' through use of locally available materials.

Middle stage: The teaching/learning strategy in the integrated science course is heavily based on the students' varied experiences in their environment. It is hoped that such an education will equip them with knowledge and skills for understanding of their immediate environment to be able to take their part effectively in the society of the future.

Non-formal education: The main objective is to help pupils to improve the quality of their life through non-formal education. Emphasis is on competencies which students can use in solving problems of their day-to-day life.

Strategies for introducing environmental education

In grades I to V, Environmental Studies are taught as a separate subject. In grades I and II the social and physical aspects of the environment are studied without being differentiated as such, under units like Our Family, Our Home, The School, Our Neighbourhood. In grades III to V, Environmental Studies Part I deals with the social studies component and Part II the science component.

In other classes, environment education is integrated into the content of existing subject areas.

Under non-formal education, all the learning activities are real-life-centred, problem-oriented and need-based. They are related either to conditions of the physical and social environment, or parental occupations, or students' vocations.

Preparation of curriculum and instructional materials

The concepts of environmental education at the primary and middle stages are presented in the instructional materials such as textbooks and teacher's guides in the form of activities of various types. At higher levels they are presented as logical contents of textual chapters.

For grades I and II, there is no textbook of environmental studies. A teacher's guide has been prepared. In a brief introductory chapter, information in provided about what constitutes environmental studies, its importance, the role of teachers in environmental studies, and the syllabus in environmental studies. For each of the seven units of the syllabus, some guidance and sample instructional materials are provided for the teachers so that they may plan and think on their own for the remaining topics of the syllabus.

For grades III to V there are textbooks, namely 'Environmental Studies' Part I and Part II for grades III, IV and V respectively. The presentation of the Content in Part II (i.e. General Science) has been done in such a way that learning activities can be organized by the teachers using their local environment and resources. Corresponding teacher's guides for textbooks of grades III, IV and V have also been developed.

The content in Integrated Science textbooks chapters of the middle level has been presented as chapters corresponding to the units of the syllabus. Each chapter is divided into five sections, namely: (1) Observations, (2) Questions, (3) Let us find out, (4) Activities, and (5) What have we learnt and how is it relevant?

The list of topics of direct social relevance given below would indicate the extent to which the environment in its widest context has been reflected in the textual materials.

Middle stage

1. Food and health
2. Man's dependence on plants and animals and the balance in nature
3. Adaptability to the environment
4. Water
5. Energy
6. Population
7. Pollution
8. Agricultural practices and implements
9. Our crops
10. Useful plants and animals
11. Improvement of crop production
12. Animal husbandary
13. Conservation of nature and natural resources
14. Science and human welfare

Children have observed the use of the principle of 'expansion on heating' for putting the iron circular frame tightly over the wooden wheel.

Secondary stage

1. Ecosystem
2. Biosphere
3. Ecological crisis
4. Conservation of natural resources
5. Crops and factors influencing crop production
6. Various agricultural practices
7. Improvement of crops
8. Elements of animal husbandary
9. Functional anatomy of human reproduction system
10. Pregnancy and childbirth
11. Infancy, childhood and adolescence
12. Trends in world population
13. The population problem in India
14. Communicable diseases of man
15. Nutritional disorders of man[1]

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[1] Atreya, B.D., A.K. Mishra and G. Guru. *A study in the area of adapting research and technology education to changing society and to the diversity of needs; study report sponsored by Unesco, Paris.* [New Delhi, National Council of Educational Research and Training] 1980.

The problem of awareness of the environment can be tackled in both formal and informal education. The formal is restricted to educated people and can be imparted at school, college and university levels. Informal education, through the mass media, can cover a whole population at all ages. Among the different mass media of communication, the radio is a very important medium to stimulate the people. Under the National Feature Programme, some efforts are being made to create mass awareness of environmental problems. Two programmes, *Green gold in peril* and *Man's inhumanity to earth,* written, produced and presented by Chitra Narain, may be mentioned in this connection.

Learner activities

In grades I and II the learning is mainly through activities based on observation of the local environment (both social and physical) and consolidation of the knowledge thus gained through discussion. In grades III to V, besides the observation-discussion type of activities, children perform experiments and investigations, but always using things that are locally available. These activities may involve science processes like measuring, collecting and classifying, making a record, and analysing data.

In the integrated science course for grades VI to VIII, the textbook chapters follow a sequence that suggests the strategy of organizing the learning activities. The first section of the chapter includes a number of observations from the daily life experience of a child. The second section gives 'questions' that follow logically and naturally from the first section.

Children can have immense interest in observing phenomena in nature

Children playing by making their paper boats float on water, incidentally learning several principles of science

These are the questions that many children would often ask. Answers to these questions or necessary information to get the answers is provided in the third section. The next section on 'Activities' gives practical exercises which students may do in school or at home. These exercises are designed to make learners think and also develop certain skills, as well as to consolidate knowledge. The last section gives a summary of the chapter.

The learner's activities proposed under non-formal environmental education are to be centred on real life. Activities for learning are selected from day-to-day life situations, the conditions of the parents and from the vocations in which children are employed. Only such activities are suggested as can be performed by the NFE Centre teachers without any equipment being supplied to them. Also the activities are manageable within the two hours' time—in the evening or at night—allotted for instructions.

Mechanism and procedure for curriculum development

The instructional materials in environmental education are developed through workshops involving participants belonging to different disciplines from the different states of India. Often the first drafts are prepared and the final editing is done in the Departments of NCERT.

Primary education. Different types of curricular and instructional materials in environment education have been developed. These are briefly described here.

A. One of the centres of activity in this field is the Department of Education in Science and Mathematics (DESM), NCERT, New Delhi. There is a Primary Curriculum Group in the Department associated with the development of textbooks, teacher's guides and other. The Teacher's Guide in Environmental Studies for grades I and II was developed through two workshops involving participants from the States associated with curriculum development work and belonging to different disciplines. The drafts thus prepared were edited and finalized in the Department.

The textbooks in Environmental Studies (Part II) for grades III, IV and V were written by members of the Primary Curriculum Group. The teacher's guides to these textbooks were developed through workshops.

The DESM also published in 1978 a booklet under the title, *Using the environment and local resources for science education at the primary stage–guidelines for State Institutes for Developing a Handbook for Teachers of the State.*

This booklet was developed through four regional workshops involving three participants from each State of the country (a curriculum developer of SISE in the State, a teacher educator of any teacher training school in the State, and a workshop instructor). The Guidelines are being used by the States to develop teacher's handbooks on using the environment and local resources to teach the state syllabus in primary science. The work comprises six steps:

1. Preparation of the first draft through a workshop involving teachers, teacher educators and others,
2. Editing at another workshop, making it printworthy in all respects; also preparing the lists of tools that need to be supplied for tryout,
3. Printing of the book, and procurement of the tools kit, and supply to experimental schools,
4. Orientation/training of teachers and other personnel involved in the tryout,
5. Tryout of the handbook and collection of feedback, and
6. Revision of the handbook on the basis of feedback.

The DESM has co-ordinated the work of another project, the 'Environmental Education Pilot Project in India–Experimental Implementation of Environmentally-based Modules' (Unesco-Sponsored). These modules were developed in a workshop held in December 1976 in DESM/NCERT New Delhi, and organized under APEID of Unesco Bangkok, jointly with NCERT. The modules exemplified science concepts as derived from real-life situations in the rural environment. During 1979/80, the NCERT undertook, in collaboration with Unesco, a Pilot project for an experimental implementation of these modules in the States of Assam, Punjab, Karnataka and Tamil Nadu for limited tryout and evaluation.

One person from each State's SISE/NCERT designated as a Co-ordinator for the project was oriented in DESM. The modules were translated into regional languages, duplicated and used for tryout. Under the project there was also a provision for revision of the modules and development of more environment-based modules suited to meet the specific needs of the respective States.

B. Some developmental work in the field of environment education is being co-ordinated by the Primary Curriculum Development Cell of the NCERT, under two UNICEF-Assisted Projects, namely 'Primary Education Curriculum Renewal' (Project 2) and 'Developmental Activities in Community Education and Participation' (Project 3).

These projects were initiated in 1975-76 in thirty schools and two community centres in 15 States and Union Territories. From 1979-80 the work has been extended to 100 more schools in each State and involving some more community centres. The development of the curriculum has been based on socio-economic and educational surveys of the conditions of the people and physical surroundings of the villages where project schools are located. Environmental Studies (both General Science and Social Studies) constitute one of the subjects, others being language, mathematics, Art and Creative expression, Health and Physical Education, and Socially Useful Productive Work.

Teacher education programmes

During 1978-79 the DESM/NCERT organized a programme for training in-service teacher education personnel in environmental studies for primary schools. The training strategy involved the organization of:

1. A pilot/trial workshop at NCERT, New Delhi, and
2. Four regional workshops, one in each of the four regions (south, east, north and west) for State personnel who are open-minded and receptive to the 'environmental studies' style of teaching and who were expected to become involved in in-service training work

in environmental studies in the near future. Many participants of these workshops were non-science graduates. This was arranged with a view to infusing a multi-disciplinary atmosphere in work and discussion.

Each workshop was organized in two phases of five days each with an interval of several weeks. The workshop programme offered a pattern which the participants could use in their own subsequent in-service training activities. The efforts in regional workshops resulted in eight cyclostyled reports. The DESM is now consolidating these reports and preparing from them a Teacher's Handbook in Environmental Studies.

Under this Project, with assistance from the British Council, were also developed a series of tape/slide sequences designed specifically for use in the training of teachers. The topics were chosen to show how the philosophy of environmental studies could be developed in practice with primary school children.

Special teaching materials

Some States have developed teacher's handbooks in the respective local languages on the use of the environment and local resources for teaching of science at primary level. Several books published by NCERT which are useful to teachers in environment education are the following:

1. *Teaching of science by using local resources*
2. *Environmental studies, a teacher's guide,* classes I and II
3. *Teacher's guide for non-formal education* (in Hindi)
4. *Curriculum guide on nutrition, health education and environmental sanitation.*

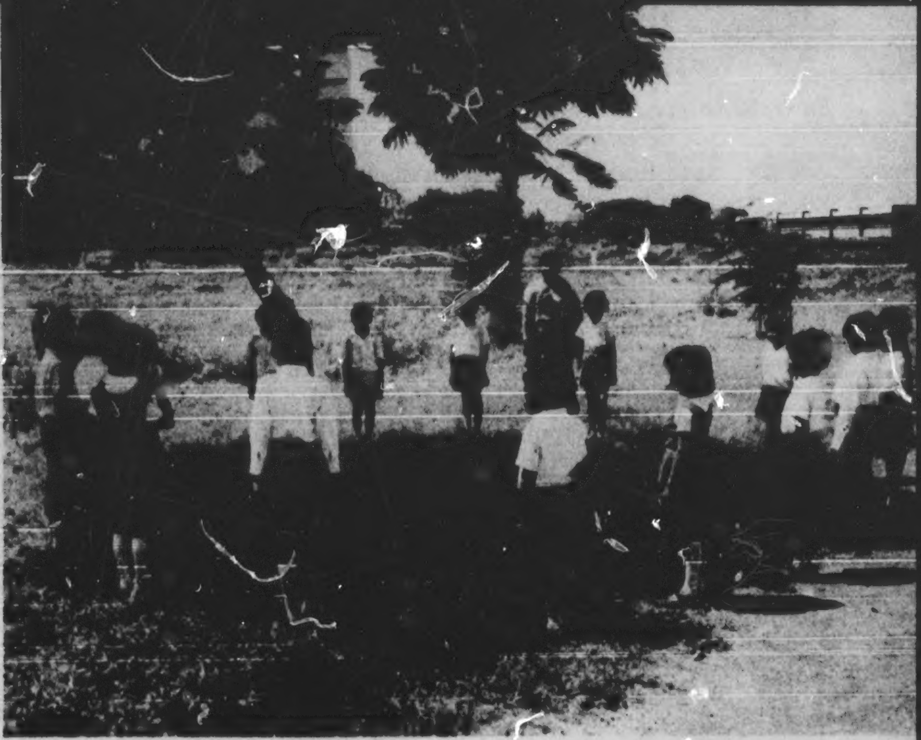
Two films have been produced by the Department of Teaching Aids of NCERT, namely:

1. *Learning science through environment—rocks and soils*
2. *Learning science through environment* (colour) 16 mm.

Evaluation and costs

The Environmental Education Pilot Project in India (Unesco-sponsored) offered an opportunity for limited try-out and evaluation of modules based on real-life situations in the rural environment. On the basis of personal visits to the tryout schools, it can be said that the children had little difficulty in performing most of the activities suggested in the modules. The teachers and pupils were found to be inspired by the new type of work in most of the schools visited.

The data available cover only an insignificant part of the total efforts being made in this vast country at different levels. Hence, cost figures for



A teacher and her class asking themselves, 'How big is the shadow of this tree? ', an Environmental studies method of teaching the concept of area.

all activities cannot yet be given. The non-formal education programme launched by NCERT is being implemented through the Regional Colleges of Education and NCERT Field Advisers in the States. At present, nearly 200 centres are working. The cost is kept to a minimum (Rs 2.00 for the books and Rs 10.00 for the equipment per child).*

Co-ordination and future prospects

The co-ordination of various programmes of environmental education at different school levels is done mainly by NCERT, the technical wing of the Ministry of Education and Social Welfare in the Centre, with the help of corresponding counterparts in the States, namely State Councils of Educational Research and Training, State Institutes of Education and State Institutes of Science Education. This mechanism works by-and-large within the system of education. The Department of Science and Technology (DST) is also playing an important role. On World Environment Day, 5 June 1980, two brochures (*Threatened environment* and *Life-giving water*) developed by the Gandhi Peace Foundation, New Delhi, were brought out by the DST.

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*Approximately 7.90 rupees = one US dollar.

The Government has set up within NCERT a National Committee on Environmental Planning and Co-ordination which identifies important problems relating to the environment, and makes recommendations to various government departments, civic authorities and industries on environmental and allied matters. NCERT is also co-ordinating the work of a UNICEF-assisted project on Nutrition, Health Education and Environmental Sanitation at the Primary Stage (described below).

Environmental education has a challenging future in India for both in-school and out-of-school populations. Under the 10 + 2 pattern of education, most of the States and Union territories are implementing a primary curriculum with environmental studies as one of the subjects. The integrated science course is also likely to become more and more popular with the States, and will promote the objectives of environmental education. At the secondary and higher secondary stages also there is a growing trend in relating the course to environmental problems and needs at appropriate places.

For non-formal education, the entire strategy of curriculum development is based on the needs of the learner in the immediate environment. As the non-formal programme is progressively implemented, so would the ideas of environmental education be disseminated among the population.

Project on nutrition, health education and environmental sanitation at primary level

The health status of the child is a dynamic balance of the interactions between the child and its physical,biological and psycho-social environments. This implies that any curriculum on nutrition, health and environmental sanitation meant for the child, to be effective, must relate to the physical, biological and psychological environments of the child. This project attempts to develop a dynamic programme to carry messages to school children as well as out-of-school population of the society and help them adopt desirable nutrition, health and sanitation practices—and enable them to participate intelligently in community health activities. Thus the project lays great emphasis on education for a better environment.

To implement the programme, five regional centres were established. Each regional centre developed a curricular package for primary school pupils and teachers following a detailed survey of local conditions and existing nutritional health and sanitation habits. Nearly 7,500 teachers from 2,500 primary schools were trained, this affecting nearly 300,000 children.

It was understood after the first years of implementation that desirable nutrition, health and sanitation practices cannot be developed in children in the school isolated from the community. So a second phase of the scheme started from June 1979 in which the programme was extended from school to the community. Some important messages to be communicated to the community and relevant to environment education are:

1. Use clean, safe water for drinking and cooking.
2. Use drainage water for raising food plants: make provision for a soak pit.
3. Provide sanitary facilities in the school and the community. Do not defecate or urinate or spit anywhere but in the places provided.
4. Keep your school, home, and village surroundings clean.
5. Make provision for depositing waste, food garbage and animal waste in compost pits.
6. Do not pollute sources of water.

Evaluation of the scheme has indicated that it has had an impact on the awareness of the community and, particularly, on the health and nutritional status of children in the participating schools. The community contact programme run by teachers has had a very encouraging effect on the development of desirable habits.

Developing a Teacher's Handbook

The title is 'Use of environment and local resources--development of a teacher's handbook'. About 20 States in the country have worked under this project. The instructional materials developed comprise a printed handbook in the regional language, a set of tools, and other teaching aids. There is provision for orientation/training of teachers and teacher educators. After the tryout the handbook is revised in terms of the feedback.

Once an appropriate package of instructional materials has been developed, tested and finalized, its dissemination into an increasing number of schools is left to the States' own efforts.

The ultimate aim is to develop in teachers an appreciation of the rich potentiality of the environment, to provide them with abundant teaching situations and to foster the skills, both mental and manual, to be able to select and use these situations, either by direct use or through improvization, for teaching the content of the primary science syllabus.

Primary school teachers were involved in the curriculum development activity. The strategy of developing the handbook based on the concept of decentralized planning, with each State trying to develop its own model suited best to its needs, is a special feature. □

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INDONESIA

by Ida Sinambela

National mandates and major problems and issues

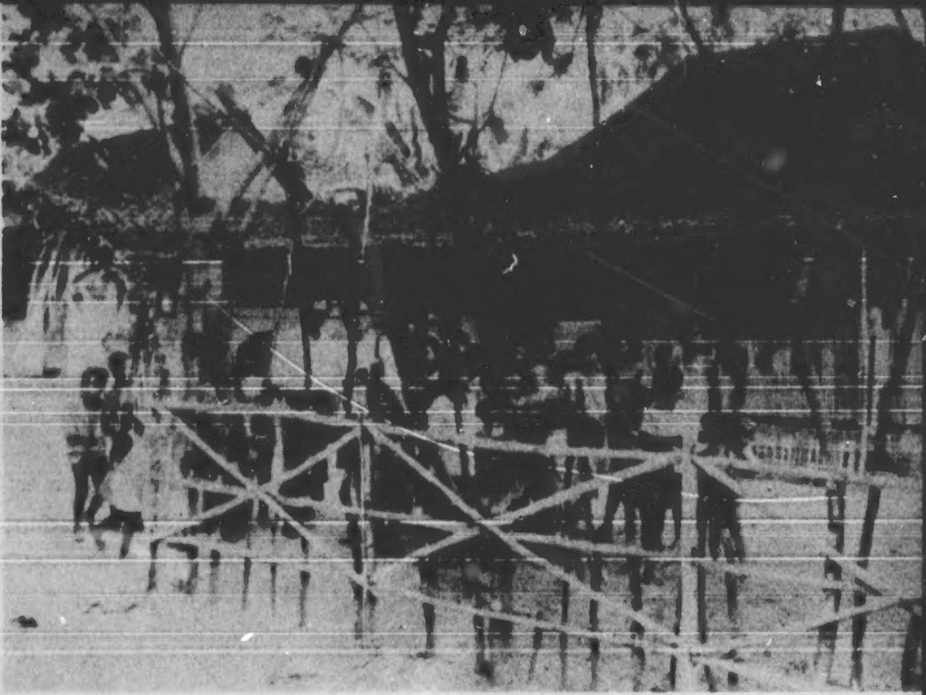
A Workshop on Human Environment and Existing Pollution held in Jakarta in 1971 and a Seminar on Human Environment held in Bandung in 1972 initiated the Indonesian report to the United Nations Conference on Human Environment in June 1972 at Stockholm. The Ministry of State for Development Supervision and Environment (Menteri PPLH), established at the Conference to co-ordinate work for the development of the human environment, aims at managing and developing natural resources and maintaining a balanced ecology. According to the Ministry, there are eight main problems, namely:

1. Destruction of forests,
2. An increasing number of uncultivated fields,
3. Increasing erosion,
4. The accumulation of mud (silting); rivers become shallower, thus stimulating overflow and flooding,
5. Reduced availability of water, and water pollution,
6. Ocean pollution as a result of mining exploration and overfishing,
7. Decreasing plant and animal life, and
8. Worsening of human health.

In summary, the enormous problems of the present time can be consolidated into two:

- The increasing destruction and deterioration of the human environment, and
- Lack of knowledge about environmental quality throughout the whole country.

To begin to overcome these situations, serious actions and good planing are needed. Since the launching of the Third Five-Year Development Plan (called *Repelita III*, 1979-1984), for the first time the management of natural resources and the human environment has been identified as a separate sector.



The problems cited may be caused by or augmented by the increase in the human population. In 1980, the population of Indonesia was about 140 million, with a growth rate of around 2 per cent per year (it cannot yet be assumed that the birth rate has declined, in spite of the success of birth control programmes in Java). About 80 per cent of the population live in rural areas. Environmental problems occur in both rural and urban areas.

Problems in urban areas

As we have seen, some 20 per cent of the population live in cities and towns. The urban situation consists of complex facilities and common services. Migration from the villages to the cities increases the growth of the population in the city to more than four per cent per year. This new urban population cannot find enough employment, especially industrial. Further, the effect of overpopulation causes problems in the following areas:

–Land use,
–Water resources,
–Facilities and common services,
–Sanitation, garbage disposal and hygiene,
–Water and air pollution (the result of industrial activity and technology), and
–Environmental health.

These problems exist because of human activities, which are not taking into account the carrying capacity of the environment. A continuing deterioration process often sets in, until adverse environmental factors become irreversible. To avoid such situations, the Government has initiated the following actions.

The general directions of development of cities have been modified in the National Development Plans, such as:

1. Action for reconstructing home areas, with reconstruction and building of low-cost housing for low-income groups;
2. Development of various common services and facilities, such as:
   - Environmental health facilities, drinking water, sanitation, drainage, waste and garbage disposal
   - Schools
   - Play and recreation facilities
   - Electricity systems;
3. Overcoming air and water pollution;
4. Managing transportation systems;
5. Managing land use in city development plans for industrial areas, green areas and home areas;
6. Providing awareness in society and promoting positive environmental conditions.

Problems in rural areas

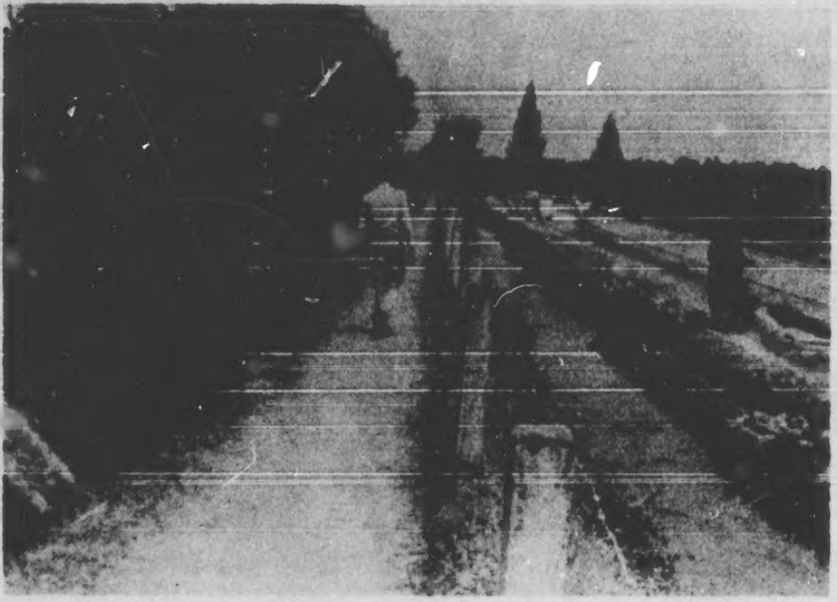
Villages need simple common facilities as compared with urban areas. Population problems in terms of crowding are not yet overwhelming. The priority is on striving to maintain land and water resources for inhabitants and for farming and agriculture. Land erosion is a very serious problem. Plant diseases and weeds in agricultural areas are also matters of concern.

The general direction for development in villages is the rehabilitation of the land, such as by:

- Reforestation and the 'green revolution' by the Forestry Department, especially in bald fields,
- Water conservation, including building check dams, designed cropping systems and crop rotation.

Major environmental actions

Targets for environmental development in terms of the National Directions–the concern of the Ministry of State for Development Supervision and the Environment–are:



- Constructing harmonious human relations with the environment,
- Everlasting natural resources, for being of use from generation to generation,
- Avoiding deterioration of environmental quality and leading to an improvement in standard of living, and
- Guiding the society from *environment destroyed* to *environment constructed.*

For achieving these targets, the Third Five-Year Plan (*Repelita III*) has indicated four working programmes, as follows:

1. Forest, land and water conservation, such as the 'green revolution' reforestation, water flow development areas and other,
2. Pollution control in the various sectors,
3. Improving the human condition, and
4. Developing awareness in people regarding environmental issues.

To reach the fourth target, environment consciousness has to be developed involving changing mental concepts, attitudes and performance. The effective way to attain this is through education, formal and non-formal, and the sooner the better, starting from kindergarten.

Curriculum development and implementation

To achieve an awareness among people of environmental issues, a series of programmes on environmental education was developed. The long-term objective is to ensure that the young generation will be prepared and supplied with knowledge of the environment, and that they will be motivated to participate in maintaining the human environment.

Environmental education aims toward giving understanding and knowledge to school children and the general public about the environmental effects of human activities carried out for the development and use of natural resources and the environment.

Since the establishment of the Indonesian National Committee for the Man and the Biosphere (MAB) Programme in 1975, current activities in environmental education include co-ordination of formal and non-formal education. A working group was first established for each type of education. These teams were charged with studying existing curricula to find the appropriate situations for introducing environmental education, determining the best methods of teaching from the standpoint of both pupils and teachers, developing educational modules, organizing training for teachers, and implementing the modules produced in selected primary schools in Jakarta on an experimental basis.

The formal programme. The educational system in Indonesia introduced a new programme, called Curriculum 1975. In this curriculum, especially at the primary level, the subject matter on environment was not spelled out clearly. In view of the heavy load already imposed by the new curriculum, the introduction of a new subject area was to be avoided. It was concluded that it was not necessary to introduce a new discipline: the aims of environmental education were to be achieved by giving due emphasis—or indicating the environmental relevance—in the several subject areas required by the existing curriculum. Several subject areas were involved where environmental education could be conveniently grafted such as Religion, *Pancasila* (Morality), Physical Training and Health, Social Sciences and above all Natural Sciences. For this purpose two educational modules were developed, for teachers and for pupils.

To implement environmental education, a series of meetings and consultations were undertaken with various institutions. Moreover, the local population around the school community had to be informed of this plan so that their assistance could be solicited. There were five phases in this implementation plan:

Phase one. Preparation

- Consultation with the principals of the local community, the headmasters, other teachers of the same schools, school supervisors and others.
- Preparation and distribution of audio-visual aids and posters.
- Preparation of locally-specific subject matter/modules for children by the respective trained school teachers.

Phase two. Simultaneous execution of environmental education in the five schools selected.

Phase three. Mid-term evaluation

After two months of operation of the programme, a mid-term evaluation was undertaken, to find out whether or not the modules met the requirements; what its shortcomings were and how to improve them.

Phase four. Final evaluation

The academic records of each pupil participating were studied; their involvement and activities in group actions were expected to be physically visible in the school community, and the opinions of the local community were solicited.

Phase five.

- Preparation of evaluative reports accumulated during a workshop to evaluate the performance of this pilot project as a whole.
- Preparation of a five-year plan for environmental education.

Monitoring and evaluation on the progress of this experiment were continuously undertaken. On the whole it could be concluded that the positive effect of environmental education was evident in both the understanding and the knowledge of school children as well as in their attitude towards the environment and their activities outside the schools. The collation of the results of the children's performance indicated that 75.3 per cent of the children from pilot schools received the message and that their marks were higher than those of the control group. A panel discussion held to evaluate this project concluded that the project was a success and was to be expanded.

THE CONCEPT SEQUENCE OF INSTRUCTIONAL MATERIALS

GRADE IV

First term

1. Social Sciences: Home, school and community—*Conditions and situations around the house, school and village community: their topography, soil, water, plants and animals around them and the understanding that the whole represents one ecological system.*
2. Social Sciences: The physical geography of the province—*The topography, plant life/vegetation, animal life, the river systems, and the understanding that all units are interrelated to one another.*
3. Social Sciences: Arable land within the province—*Land utilization and agricultural systems within the province: rice field, upland agriculture, estate crops, fishery and animal husbandry.*
4. Social Sciences: Forests within the province—*The forest types, condition and utilization within the region.*
5. Social Sciences: The wealth of sea around the province—*The situation and utilization of the sea for fishery, salt industry and recreation.*
6. Natural Sciences: Water cycles in nature—*The types and kinds of water cycles and their role in sustaining living processes.*
7. Natural Sciences: Living things require water and air—*The role of sufficient (and pure) water and air for living processes, and for ensuring the perpetuation of life on earth.*

Second term

8. Natural Sciences: Erosion and after effects—*The meaning of erosion and the direct effects on the environment: the loss of soil fertility, landslides, the siltation of lakes, rivers and harbours.*

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Third term

9. Natural Sciences: The importance of forests to sustain life on earth—*The role of forests in minimizing erosion, regulating water systems, as a refuge for wildlife and as a resource for raw materials for buildings and industry.*

GRADE V

First term

1. Natural Sciences: Natural resources—*A description of types and kinds of natural resources such as soil, water, solar energy, minerals and the renewable resources (plants and animals).*
2. Social Sciences: The islands and the altitudes of Indonesian land mass—*The variations of Indonesian islands with regard to altitudes and corresponding variations in climatic and living conditions.*
3. Social Sciences: The climate, plants and animal in Indonesia—*The interrelationships between different kinds of climate and corresponding variations of species of flora and fauna.*
4. Natural Sciences: Plants as friends and foes—*The usefulness and the harmful effects of various plant species to humans (e.g. cogon grass can be utilized as thatch or medicine).*
5. Natural Sciences: Wild and domesticated animals—*Each species of animals—has a role in the web of life (wild pythons control rats; domesticated pigs carry diseases).*
6. Natural Sciences: Humans, other animals and plants require water—*The kinds of water required by man, other animals and plants. Water polluted by detergents, pesticides and waste products of chemical factories has adverse effects on living beings.*
7. Natural Sciences: Humans, other animals and plants require air—*The kinds of air required by man, other animals and plants, the danger of using air polluted by factories, poisonous gasses excreted by decomposing litter, dust and other.*
8. Natural Sciences: Nature conservation—*In order to sustain life on earth, all natural resources should be wisely utilized, managed and conserved.*
9. Natural Sciences: The deforestation of mountains, and floods—*The effect of deforestation of mountains on water regulation in nature, which will bring floods.*
10. Natural Sciences: The protection of endangered animals in nature reserves—*Understanding the role of nature reserves in preventing the extinction of wild life.*

11-13. Natural Sciences: Water and air, importance to plants, animals and man—*The need to maintain a balanced environment to sustain life in an area; avoid unnecessary deforestation, do not pollute the air and water.*

Second term

14. Natural Sciences: Soil conservation—*Methods of soil conservation: contours, cover crops, terraces and rice fields.*
15. Natural Sciences: Nature conservation and erosion—*The role of nature conservation in preventing erosion through reforestation and maintaining the balance and perpetuation of protected forests.*
16. Physical Training and Health: The kinds of infectious diseases, their dispersal and prevention—*Descriptions of kinds and dispersal of infectious diseases and methods of group action to help in preventing them: no tilling outside suitable places; keep the stables of domesticated animals clean; maintain the water course properly to suppress malaria and other diseases.*
17. Religion: Respect for and utilization of natural resources around us—*A discourse on the need to respect nature around us, to maintain and use resources properly for the benefit of humans.*
18. *Pancasila* Morality: Group action to assist in maintaining the ideal environment around the school—*Field activities to clean the school compound and the surrounding areas, to beautify the school compound by improving the hedges and gardens and to assist in maintaining them all year round.*
19. Religion: Sense of responsibility towards keeping the environment healthy—*A discourse to implant the understanding that everybody in school should share the responsibility in maintaining the beauty and the health of the school environment and its surrounding areas.*
20. Physical Training and Health: Camping, cycling, exploring nature—*The need to behave correctly when on outings and try not to disturb nature.*

GRADE VI

First term

1. Social Sciences: Non-renewable natural resources—*A description and the methods of management of non-renewable natural resources to ensure their long-term utilization.*
2. Social Sciences: Renewable natural resources—*A description and methods of management of renewable natural resources, by*

continuous attempts to make them available in sufficient quantity to ensure their perpetuation.

3,4. Natural Sciences: Useful plants and animals—*The dependence of man on plants and animals to meet our basic daily requirements for food, clothing, housing and others.*

5. Natural Sciences: The respiration of plants: the producer pattern—*The role of plants as the foundation of the web of life: the relation of respiration and assimilation and the beneficial side products of these activities.*

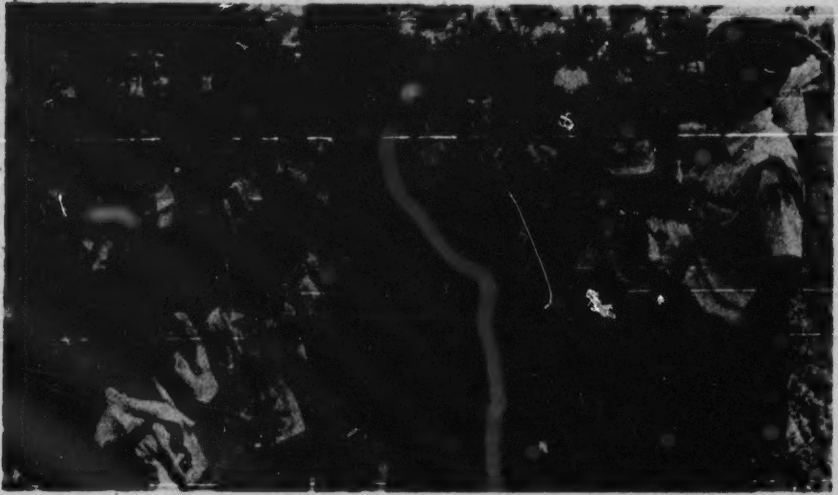
6,7. Natural Sciences: The respiration of animals: The consumer pattern--*The dependence of animals on plants for both their respiration and food.*

8. Physical Training and Health: Camping, cycling, exploring nature—*The need to behave correctly on outings and not disturb nature unnecessarily.*

The non-formal programme

The objectives of environmental education in non-formal programmes are:

1. Presenting knowledge about the human environment.
2. Presenting a background in environment for motivating people to improve it.
3. Presenting useful materials to those who need them in managing natural resources and the environment.



The activities of the working group responsible for non-formal education were also concentrated in the Jakarta area although work was done in the rural areas as well. The efforts were aimed at people of all ages using any channels proven to be effective in passing on information. Audio-visual aids were developed and promoted, and campaigning in the villages was undertaken.

Several easy-to-read pamphlets, brochures and posters were prepared and distributed to schools and village communities. Several sets of slides showing many aspects of environmental damage due to exploitation of resources have been prepared for use in lectures and discussion. Natural resource slide sets were prepared with narratives either recorded on cassette tape or printed on explanatory cards. Weekly lectures were regularly organized for school teachers and youth as well as women's associations at village or sub-district levels in Jakarta.

Attempts to involve the participation of children from all of Indonesia were made by sponsoring competitions in writing essays on environmental themes. Television and radio programmes were also provided, with broadcasts given on important environmental issues. Popular books, posters and other audio-visual aids are being published at present.

Working groups established for formal and non-formal programmes were jointly sponsored by the Indonesian National Committee for the Man and the Biosphere Programme, the Municipal Government of Jakarta, and the Office of Educational and Cultural Research and Development of the Ministry of Education and Culture (BP3K). Funds to implement some of the activities projected by these working groups came from Unesco.

The Directorate-General of Non-Formal Education and Sport, Ministry of Education and Culture, with the co-operation of UNICEF; is trying out Learning Package A, a 'minimum kit' of attitudes, skills and knowledge, for illiterates, new literates and primary school drop-outs, to help them become well-informed, responsible and productive citizens. The instructional material related to environmental education is one of the elements of essential basic learning needs in Package A: basic knowledge and scientific views on the maintenance of the ecosystem; relationship of sanitation and health; methods of farming and animal husbandry; food production; nutrition. [So that readers may appreciate the extreme variety of topics offered in this set, the list is reproduced at the end of this article.]

The Man and the Biosphere team (LIPI) for non-formal education developed various programmes of environmental education, such as for:

—The housewife, by the Women's District Organization.
—The out-of-school people, by the Young People's Organization.

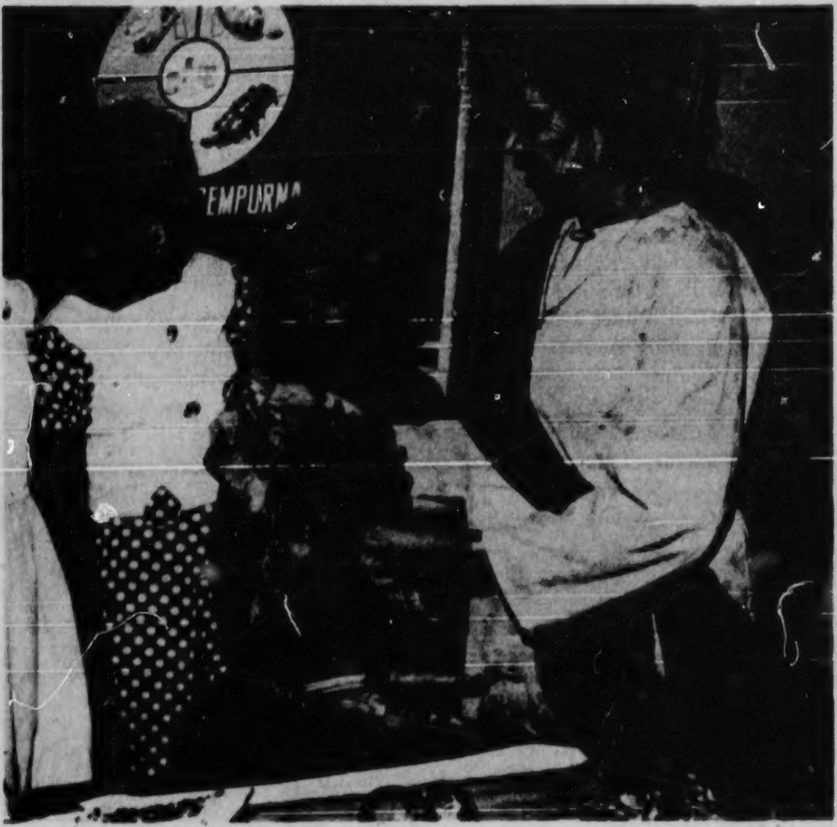
- —The school children.
- —The school teachers.

The programme included lectures, film strips, slides, posters, and leaflets.

Teacher education

The Institute of Teacher Training Education (IKIP) offers environmental education. This subject is taken by all first-level students, who will be the secondary school teachers. It is soon to be introduced in the Teacher Training School (SPG) for primary school teachers.

In-service programmes, especially to implement the pilot project of environmental education in primary schools, have been undertaken. The aim of the training was to equip the teachers with some basic knowledge and concepts of the environment and to appeal to them to develop a new



approach in presenting certain topics so that *environment*, which did not appear in the curriculum, would also reach school children. School teachers from 15 selected primary schools in Jakarta joined the training. The team, sponsored by the Man and the Biosphere programme, has produced two books, namely:

1. Teacher's guides in Environmental Education for Elementary School.
2. Module(s) in Environmental Education for Elementary School.

Future directions

For developing and improving environmental education in the country, the Government has formed Study Centres for Managing Natural Resources and Environment (*Pusdi PSL*) at 13 universities. It is hoped that the environmental education programmes can soon be implemented at all levels of the school system, including all teacher training stages. At the university level, a need for preparing specialists in managing and carrying out environmental education has been felt for such personnel as:

1. Research workers and environmental-impact assessment specialists.
2. Environmental education teachers.
3. Planners and managers of natural resources and the environment.

Topics of Learning Materials for non-formal education: 'Package A'

1 - 10. Elementary reading, writing and arithmetic
11. Home garden
12. Planting fruit trees
13. Poultry
14. Fish raising
15. Goat and sheep raising
16. Making clothes
17. Family planning
18. Garbage and its use
19. Let's save
20. Household budget
21. God, man and nature
22. Religions and faiths in Indonesia
23. *Pancasila*
24. Ethics
25. United we stand, divided we fall
26. Awaiting the birth of a baby
27. Baby care
28. Care for the growing child
29. Healthy food
30. Drinking water and clean water
31. Healthy house
32. Family and community
33. Development of youth
34. A healthy body
35. Body care
36. Indonesian morning gymnastics
37. First aid and family care
38. Some contagious diseases
39. Common diseases in Indonesia
40. Food conservation
41. Planting coffee
42. Planting coconuts
43. Bee keeping
44. Keeping silk worms
45. Raising rabbits
46. Co-operatives

47. Building a new village
48. Playing football
49. Indonesia, World Champion in badminton
50. Swimming
51. *Pencak Silat* (Self defence)
52. Let's paint
53. Home decorating
54. Some mining products
55. Resources of the sea
56. Plantation and forestry
57. Livestock products
58. Indonesia, my homeland
59. Islamic holidays
60. Christian holidays
61. Hindu holidays
62. Buddhist holidays
63. Leaf,flower and fruit arrangement
64. Customs in Sumatra
65. Customs in Java
66. Customs in Nusa Tenggara
67. Customs in Kalimantan
68. Customs in Sulawesi
69. Customs in Maluku and Irian Jaya
70. Cow and carabao raising
71. Planting cloves
72. Home industry
73. Handicrafts
74. Constructing roads and bridges
75. Gymnastics
76. Walking and running
77. Jumping and throwing
78. Playing volleyball and basketball
79. Playing handball
80. Playing baseball
81. Playing table tennis
82. Folklore
83. Musical instruments
84. Artists and their work
85. Weaving palm leaves
86. Folk theatre
87. Preserving our cultural heritage
88. Preservation of nature
89. The green revolution
90. Maintenance of public places and facilities
91. National movements
92. National heroes
93. National holidays
94. Defending the national flag
95. Government structure
96. Parliament
97. Taxes
98. Indonesia, a constitutional state
99. Courtesy on the road
100. Five-year development plan □

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IRAN

by Abbas Gholasuali-Dehkordi

Environmental problems and issues

Like all other countries Iran has accepted international recommendations concerning environmental education. Nationally, many official bodies deal with these recommendations, including the following:

- Environmental Conservation Organization
- Health Department
- Municipal Councils
- Ministry of Health and Social Services
- Forestry Department

Humankind is part of nature and must maintain a balanced ecology in order to survive. People must benefit from nature and use its resources without destroying or spoiling it. These principles are used in defining terms in the national mandates.

The late Shah tried in the last 15 years of his regime to industrialize and Westernize the nation, without taking into account the Iranian and Islamic culture. He was taught by Western counsellors that industrialization and modernization was the road to prosperity for any developing nation such as Iran. But Iranians did have a very old civilization and a well-developed culture which they have used for thousands of years. It was not easy to change them.

This policy of modernization caused migration of country people to the towns, particularly those with industrial potential such as Teheran and Esfahan. This caused environmental problems. There was overcrowding, air pollution, poor health among the newcomers – and difficulty for the different organizations which had to deal with these newcomers, because they were not planned for.

The second national problem was that few people were left to carry on traditional agriculture. So the rural people, whose occupation was to produce agricultural products, themselves became consumers. The Shah believed that natural problems such as dry weather and limited water resources made it unwise to invest in agricultural development, so food had to be imported. So after starting assembly industry in Iran there were problems of shortage of labour. Labour was imported from several countries and so food was imported for them as well.

Further, the different cultural backgrounds caused many problems, especially for the young generation and caused the imitation of most of the unrestrained actions of these foreigners.

After the revolution the international economic boycott of Iran caused hardships and brought industry almost to a standstill, causing unemployment to rise. The Islamic Government therefore decided to nationalize industry, banks, insurance and foreign trade, and to invest in the agricultural areas. Following these programmes, the country is now self-sufficient in wheat.

The use of fertilizers, especially manure, has caused problems with parasitic diseases in the paddy fields of the north and centre of Iran. To stop these from spreading, water filtration and piped water and sewage systems have been introduced. Filtration systems are also removing unwanted minerals from natural water sources in some parts of the country.

Problems such as pollution from brick, cement and other factories are monitored according to relevant international regulations. For instance, these regulations say that the air around cement factories should not carry more than 200 mg dust per cubic metre. In Esfahan this limit is lowered to 100 mg. The Caspian Sea has a high level of pollution partly caused by factories on the Soviet side of the sea.

The problem of drug smuggling grew during the revolution, when international rings of smugglers took advantage of the country's instability. Young Iranians, unaware of the terrible consequences of addiction, found cheap heroin and opium readily available, tried it, and became addicted. After the revolution there were about 2,500,000 addicts in Iran, compared with a work force of about 7,000,000, or 40 per cent by proportion. The country is now making an all-out effort to overcome the problem. New legislation has been passed by the Revolutionary Council and after three months more than 30 tons of opium and 600 kilogrammes of heroin and other drugs derived from morphine were confiscated by the Government. Many smugglers were executed. Addicts are now taken to hospitals, and most of the former higher-class hotels are used to accommodate and cure these addicts.

Iran also has a political environmental problem concerning almost 40,000 Iranian settlers who have been forced to leave Iraq. These have received help from schools, hospitals and other services, and from the ordinary people and the government in their resettlement in Iran.

The government has also introduced regulations to combat paracholera, an epidemic disease which occasionally spreads from India.

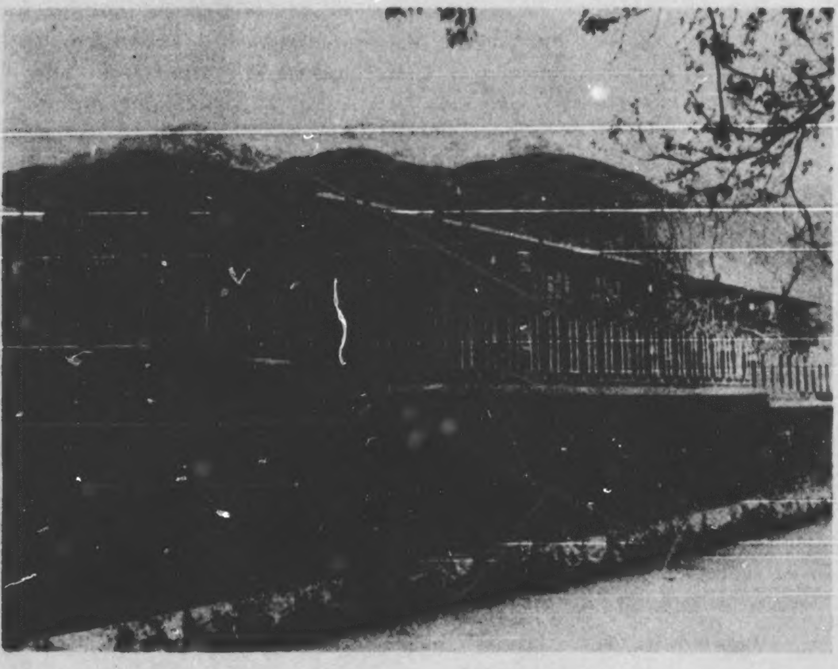
Before the Islamic Revolution, there had been some talk about burning spent nuclear reactor fuel from Iranian power stations and from reactors in Austria, West Germany, France and the United States of America in the salt desert in the centre of Iran. This would have produced a regional environmental disaster, causing suffering to future generations. Oil is also a source of environmental problems. Shipping in the Persian Gulf, oil exploration and the oil refineries all over Iran pose problems, although there are regulations to control the activities of the refineries.

Earthquakes cause great problems, especially in the northeast, which is in the earthquake belt. Multitudes of people have lost their lives, and others all their earthly belongings in earthquakes in Iran. Many in the worst areas have now been moved to safer areas and resettled in specially designed houses.

Curriculum development

In elementary school there is no particular definition for environmental education. Junior high school includes some environmental studies under the heading of Qualitative life.

Elementary school, where study of the environment is included in science, is a five-year course from the age of 7 to 12. The first-year



science book contains 112 pages on environmental studies, the second-year book 134 pages, the third 142 pages, the fourth 178 pages and the fifth 212 pages. A quarter of the content of these books concerns environmental education.

In the first year, for example, a child will be taught how to keep himself and his clothes clean and how to wear them so that he will be protected from both cold and heat. In his second year, he will be taught how to feed himself and how the environment can contaminate his food. In his third year, he will learn about diseases and bacteriology and how these can affect his environment and the food in his surroundings. In his fourth year, he will learn how plants and animals grow and about their dependence on environmental conditions. In his fifth year, he will be shown the reactions of his body to his environment.

Environmental education is made an integral part of the elementary school science programme because at this age a child learns mostly by observations and feelings. He relates what he sees in nature with what he reads in the book. The curriculum is arranged in such a way that he can use the knowledge and understanding he has acquired in his environment.

The objectives of the science programme are that the child in primary school will become familiar with qualitative life and with ways of learning about it. Films, slides, posters and television are useful and instructive, as are school expeditions. There are television programmes devoted to the environment especially for children. The family is one of the most effective factors in learning about the environment.

Practical activities related to environmental study begin mostly in secondary school. Students go to factories to get information on the production processes, prepare reports, and find out about environmental pollution. They investigate the reasons for pollution according to the information gathered in their reports. Sometimes they make posters and slides and plot graphs showing pollution changes. According to their individual interests, they may take photographs or prepare graphs and exhibit them in classrooms and official buildings.

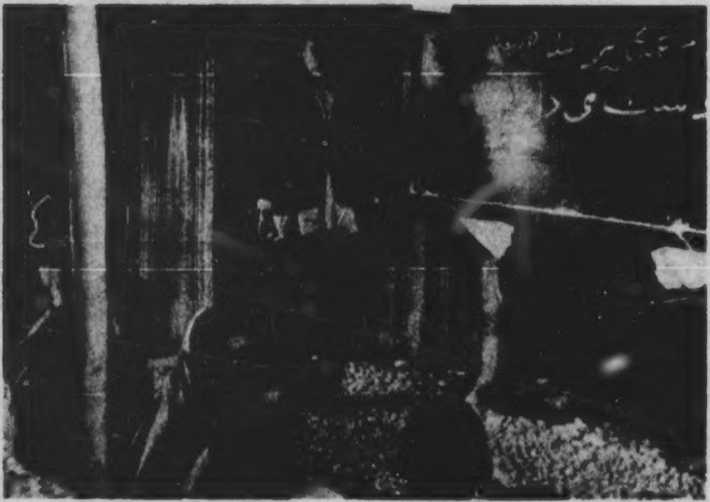
An investigation bureau reconsiders textbooks each year and makes them more interesting. This bureau asks the general public generally and educationists specifically to suggest changes, and adopts the best suggestions for improving the books.

Teacher education

After 12 years of formal study in elementary (primary) education, teachers in primary schools and junior high schools undergo a two-year course at teacher training college, learning psychology, methods of teaching and how to use educational materials such as audio-visual aids. They are taught how to assess learning and their pupils' abilities in discovering natural phenomena. They also learn how important environmental education is and how to teach children about everyday activities like travelling between home and school and shopping, about the functions of the police, postman, teacher, doctor, and about the specialized work of aircraft pilots, sea captains and army officers.

For each topic, special lesson kits are available which contain the information that students should learn. Another technique is arranging school expeditions; for example, to teach about pasteurized milk. The teacher takes the students to a milk factory and shows them the pasteurizing process. After the visit, the students are required to make reports on their observations. They should also give the class their personal views.

Senior high school teachers undergo a four-year course at teacher training college, and are also taught that students have to be trained in environmental knowledge.



Environmental action

The Ministers of Agriculture, Health, Industry and Education work together on environmental problems, and decisions made by them serve to co-ordinate national programmes.

Certain weeks in the year have been designed as "National weeks for cleaning up". Their purpose is to educate people in the cleaning of towns and villages, and to solve environmental problems locally and nationally. In this programme everybody learns by doing and becomes familiar with many types of environmental problems.

There is no legislated evaluation but there is a kind of public assessment which works well.

Iran has not organized, step by step, plans for the future, but emergency plans are carried out in different public and private sectors. For example, the cost of water pipes and sewage plants for villages around Esfahan is about 100 million US dollars.

Future directions

Iran's future directions for environmental education are based on the 50th Principle of the Islamic Republic Constitution, which is as follows:

> *"In the Islamic Republic of Iran, conservation of the environment, in which the present and future generations will grow, is a general duty for everybody. Therefore, economic activities and other activities which cause pollution of the environment are forbidden."* ☐

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JAPAN

by Naoyoshi Koya

Environmental administration

Development of environmental administration in Japan can be classified into three periods:

First period (1955-1964): Formation of policy

The remarkable development of industry brought with it the problem of pollution. During this period the need to work out countermeasures became apparent, and an environmental administration policy was drawn up.

Second period (1965-1970): Development of measures to prevent pollution

Rural and regional development projects made environmental pollution a nation-wide problem. At the same time, various types of pollution were produced in the urban areas along with the raising of the material standard of living.

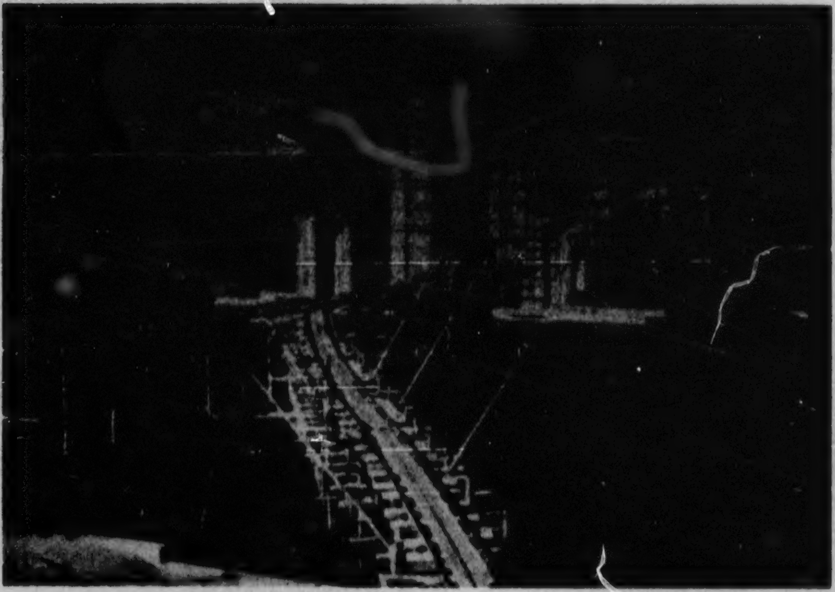
The government established in 1964 a Committee for the Formulation of Countermeasures against Pollution, made up of vice-ministers. In 1965, the Pollution Council was established in the Ministry of Health and Welfare. Thereafter, the Fundamental Law of Countermeasures against Environmental Pollution (1967) and other regulations concerning pollution were promulgated. The National Diet of 1970 was called the "Environmental Pollution Diet" after it approved 14 laws and regulations to control pollution.

Third period (1971-present): Co-ordination of administration

The Environment Agency was established in 1971 to co-ordinate environmental administration, seeking to prevent pollution and preserve the natural environment, and to manage the enactment of policy.

Since the establishment of the Environment Agency, environmental administration has developed, with the introduction of several measures to protect people from pollution, to draw up environmental standards and to strengthen the administration in preserving the natural environment.

With the development of policy and administration, the amount of money allocated by the government to preservation of the environment



has been increased. Private firms are increasingly investing in the prevention of pollution in accordance with various regulations and laws. International co-operation projects and activities have also been undertaken for the prevention of environmental pollution.

Environmental problems

In Japan, the improvement of living conditions and the development of economic activities have affected the environment to such an extent that they have caused major social problems. The most notable of these are:

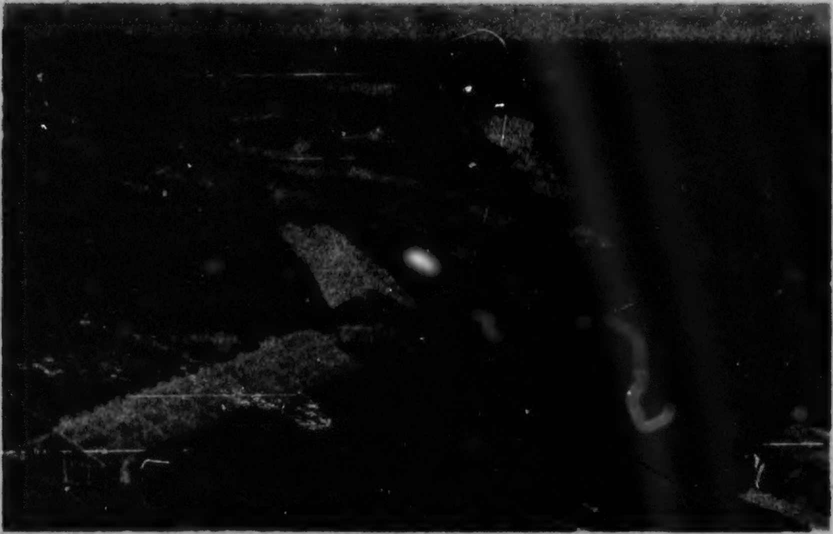
1. The spread of environmental pollution by rural and regional development,
2. The destruction of the natural environment by the construction of dams,
3. The dangers resulting from the development of heavy chemical industries,
4. The threat to the welfare of the people from the concentration of environmental pollution in urban areas,
5. The shortage of industrial resources and food, and
6. The shortage of energy resources.

These problems affect people's daily life. Examples of how this happens are:

1. Confrontation between the community and management of factories in rural areas, such as when a fish catch is reduced by water pollution from factories,
2. Destruction of animals and plants due to exploitation of the natural environment, notably through dam construction,
3. Increase of anxiety in the community when factories are built near homes, causing noise, sinking of foundations, water pollution and shortage of subterranean or 'ground' water,
4. Housing problems in large cities, particularly when there are too few houses or they are built too close together,
5. Energy cutbacks, in heating and cooling, made necessary by fuel shortages, and
6. Air pollution caused, for instance, by vehicle exhausts.

Such environmental problems are world-wide. The acquisition of resources is the most urgent and important task to be tackled, and the following measures are two of those being taken to ensure food and energy resources:

1. The promotion of fish breeding and raising, and
2. The promotion of research into the development of new energy sources to replace oil.



The Environment Agency, together with various other agencies and organizations, is tackling environmental problems and starting various activities to prevent environmental pollution, and to preserve the natural environment. The Ministry of Agriculture, Forestry and Fishery, the Resource and Energy Agency, the National Land Agency and other government organizations are also making efforts to conserve resources and to preserve the environment.

These ministries and agencies make use of the mass media to seek cooperation from the public in preserving the environment and conserving resources. The Ministry of Education, Science and Culture also makes efforts to provide suitable environmental education programmes to schools to complement the various efforts made by other ministries and agencies. In this way, the problems of environment and resources are tackled through the inter-ministerial or inter-agency co-operative activities.

Curriculum of environmental education

In Japan, the concept of environmental education is almost similar to the general objectives and content of the Belgrade Charter, but the application of the concept may differ because it is fitted into the framework of the existing education system in Japan.

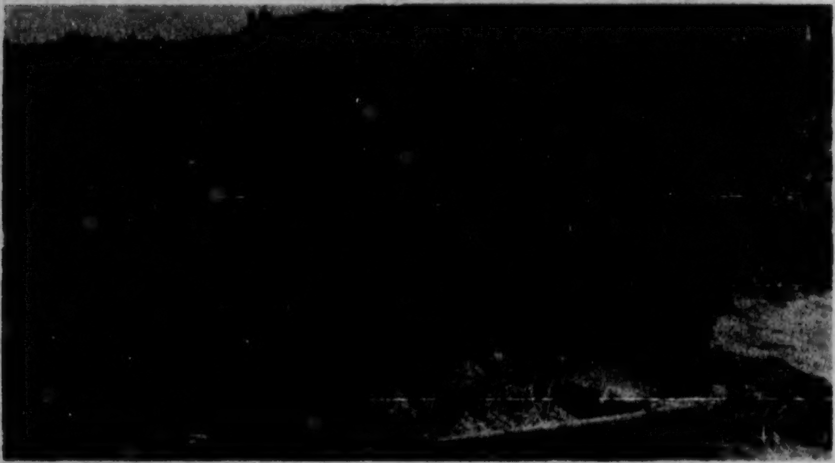
Curriculum standards for schools in Japan are issued by the Ministry of Education, Science and Culture as the National Course of Study. The

National Course of Study is revised about every ten years in accordance with the proposals submitted by the Curriculum Council.

New courses of study for primary and lower secondary schools were announced by the Minister of Education in 1977. The Course of Study for primary schools was put into force from 1980 and that for lower secondary schools will be enforced from 1981. The new Course of Study for upper secondary schools was announced in 1978 and will be enforced from 1982.

For the present revision of the Course of Study, the Curriculum Council has proposed to develop understanding of the importance of environment and resources in the teaching of Social Studies. As for Science, the importance of direct experience to the understanding of environment and natural phenomena and the cultivation of a love of nature are emphasized and proposed to be included in the new Course of Study for primary schools. Basic understanding of the natural environment and deepening of the understanding of the relationship between nature and human beings was similarly proposed for lower secondary schools. The development of sympathetic views toward the natural environment and of a positive attitude towards inquiring into nature was recommended for upper secondary schools. New Courses of Study take the above proposals into account, especially in the content of Social Studies and Science.

Environmental education in elementary, lower secondary and upper secondary schools comes mainly under the subjects of Social Studies and Science. The importance and complexity of environmental education is



fully recognized in Japan, however, and it can also be included in the teaching of other subjects. Some aspects of environmental education are taught according to school level, in the following subjects:

- Elementary schools: Social Studies, Science, Home-making, Moral Education and Co-curricular (special) Activities.
- Lower secondary schools: Social Studies, Science, Physical Education, Handicrafts/Home-making, Moral Education and Co-curricular (special) Activities and other specialized subjects.

Environmental education in elementary schools

The importance of environment and resources is taught in Social Studies. According to grade, lesson topics relating to environment and resources are as follows:

Grade I : Environment of the school, home and neighbouring areas.
- Equipment and facilities in the schools and the parks, and safety equipment on the road.
- Significance of water, electricity and gas.

Grade II : The relationship between the life of the people and their occupations in the school district.
- Environment and situations of shops, fields, fishing grounds and ports, factories, stations and post offices.
- Food production and processing of raw materials.

Grade III : Natural environment, productive activities, consumer life and characteristics of changes in life patterns of the area where pupils live, and the characteristics of life in other areas.
- Natural environment, production and consumption and changes in the environment.
- Main materials for the industries of the town, and use of resources.

Grade IV : Preservation of the natural environment, maintenance of public safety, development of the environment in the pupils' community; understanding of life in areas of Japan where environmental conditions are different.
- Preservation of natural environment and environmental development projects at present and in the past.
- Acquisition of drinking water, irrigation water, electricity and gas, and acquisition of resources by ancestors.

Grade V : Characteristics of food and industrial production in Japan.

- Popular areas for food and industrial production; also environmental pollution and offshore fishing rights.
- Food resources and industrial resources.

Grade VI : Characteristics of the history, politics and international relations of Japan.
- Trading countries and the United Nations.
- Import of resources.

In primary schools, aspects of environmental education relating to the natural environment are taught in science. General objectives for grades I and II prescribed in the new Course of Study are for pupils to acquire fundamental knowledge and skills and develop an attitude and abilities that will encourage them to examine the natural environment through various activities such as watching and testing.

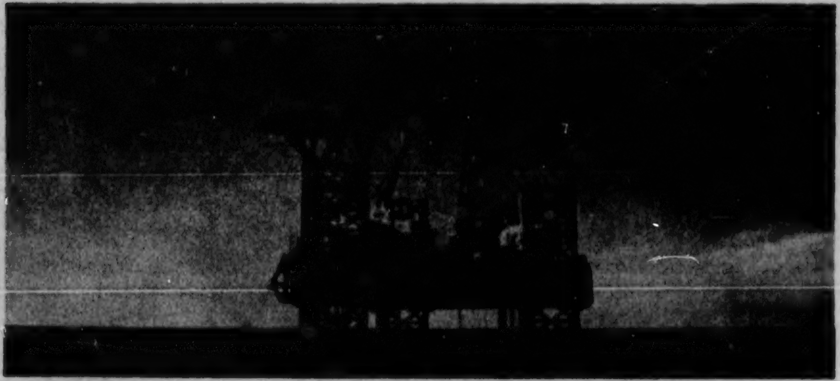
From Grade III to Grade VI, the teaching of Science is subdivided into three parts: 'Living Things and their Environment', 'Substance and Energy', and 'The Earth and the Universe'. Environmental education is included in the first part.

Environmental education in lower secondary schools

Social Studies for lower secondary schools is composed of geography, history and civics, with geography and history taught in grades I and II, and civics taught in Grade III. Environmental education is included in geography and civics.

Geography is sub-divided into three topics, and instruction on environment and resources is included as follows:

The world and its areas: Resources and industries are discussed in relation to the different areas of the world.



Japan and its areas: Development of resources and industry is explained in relation to the various areas of Japan.

Japan in the world: Current problems faced by Japan, such as population, food, resources, industry and urban areas,are discussed.

Civics is also sub-divided into three topics and some aspects of environment and resources are taught, including the following:

Democracy and contemporary social life: Family and social groups.

Improvement of people's life and economics: Prevention of environmental pollution, preservation of the environment, development, and effective use of resources and energy in terms of people's life and welfare.

Japanese politics and international society: Problems such as territorial integrity and nuclear weapons, in relation to international society and peace.

Science for lower elementary (primary) schools is divided into two parts. The first covers physics and chemistry, under topics such as 'substance and energy', and the second part includes biology and earth science.

Teacher education

In Japan, the content of environmental education is included in the new Course of Study mainly under the subjects of Social Studies and Science. All classroom teachers are requested to teach a programme based on the Course of Study, so it is necessary for them to fully understand the content of Social Studies and Science and the importance of environmental education.

In order to facilitate understanding of the new courses and to ensure appropriate teaching on environmental education in the classroom, the following measures have been taken for the benefit of teachers:

- All primary and secondary school teachers were required to undergo in-service teacher education courses in 1977 and 1979.
- Teacher's manuals have been prepared for the teaching of each subject area on the basis of the new Course of Study for primary and lower secondary schools.

Through these measures, understanding of the new subject matter among teachers will be increased. As textbooks are prepared on the basis of the Course of Study, it is also important for teachers to understand the content described in the textbooks, which are distributed free to pupils and teachers.

Environmental education in the future

Since school education is implemented in accordance with the programme announced by the Ministry of Education, each school has to revise its teaching plan whenever the Course of Study is revised.

Some schools have been designed as "Development Schools for Educational Research". In these, programmes are taught which are not based on the Course of Study. Several innovative experiments are being carried out in these schools. For example, at lower grades of primary school, the existing subjects of Social Studies and Science are integrated and taught on an experimental basis. This experiment promotes a new type of learning which enables pupils to look at the natural environment and their society in new perspectives. ☐

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MALAYSIA

by M.P. Prabhakar

Introduction

In Malaysia, government efforts to promote socio-economic development, as implied in the New Economic Policy, are increasingly being reflected by the provision of basic physical and social needs such as food, clothing, shelter, education, health, employment opportunities, consumer goods and services—especially to those in the rural areas. These efforts, guided by the twin objectives of eradication of poverty and the restructuring of society, have resulted in an appreciable improvement in the standard of living.

As the pace of socio-economic development quickens so does the pace of environmental change. To deal with this change, future generations must be equipped with a high degree of competence in understanding and managing the environment. Environmental concerns have been plaguing both science educationists and curriculum developers for a long time and are occupying natural scientists and social scientists alike. This change in emphasis is placing heavy demands on the classroom teacher.

Environmental Policy

The First Malaysia Plan (1965-1970) laid emphasis on the land capability classification study of West Malaysia. Similar land capability classification studies were carried out in Sabah and Sarawak and specific areas were considered suitable for conservation. The Second Malaysia Plan (1971-1975) on the New Economy Policy emphasized priority areas for development and gave some consideration to conservation of the environment.

The Third Malaysia Plan (1976-1980) gives even more consideration to environmental improvement and protection. It states: "It is vital that the objectives of development and environmental conservation be kept in balance, so that the benefits of development are not negated by the costs of environmental damage." The Third Plan identifies the problem areas and refers to the Environmental Quality Act (1974) and the establishment of the Department of the Environment, now part of the Ministry of Science, Technology and the Environment. Malaysia's environmental policy as stated in the Third Plan takes into account five factors. These are:

1. The impact that population growth and man's activities in resource development, industrialization and urbanization have on the environment;
2. The critical importance of maintaining the quality of the environment relative to the needs of the population, particularly where it affects the productive capacity of the country's land resources in agriculture, forestry, fisheries and water;
3. The need to maintain a healthy environment for human habitation;
4. The need to preserve the country's unique and diverse natural heritage, all of which contribute to the quality of life, and
5. The interdependence of social, cultural, economic, biological and physical factors in determining the ecology of man.

The ultimate aim of the Federal Government, in co-operation with the state governments, is to harmonize man's activities with his environment. The Government recognizes the need to balance economic and social development with the maintenance of sound environmental conditions. It seeks to accomplish this through regular environmental-impact assessment studies, which are expected on all relevant projects initiated by ministries, departments and the private sector.

The Third Plan recognizes that current environmental problems may be caused by development of land and natural resources or the discharge of waste products or effluents into the environment. It also stresses the need to preserve ecological systems when undeveloped land and forest resources are opened up. In planning industrial and urban growth, efforts are to be made to avoid overcrowding and environmental pollution. The importance of environmental education has not been overlooked in the Third Plan, which states: "... The mass media and educational institutions will be used to stimulate awareness among the general public of the importance of environmental conservation and the social and economic rationale affecting decisions on environmental issues."

There is now agreement that the environment embraces society, culture and the entire physical world: land, air, water, minerals, soils, fauna, flora, energy and human beings. Environmental concepts are to be integrated into the formal curriculum at all levels. This is required to provide the necessary knowledge, values and skills needed for pupils' participation in devising simple solutions to problems in their immediate environment.

Environmental problems and issues

In developing countries, socio-economic development to meet the rising expectations of the population cannot be reversed. Where natural resources are plentiful, as in Malaysia, it is inevitable that such development will be at the expense of these resources. Yet it does not necessarily follow that socio-economic development must go hand-in-hand with degradation of the environment. With good management and the appropriate technology, the exploitation of natural resources can be controlled and disaster averted.

The Government is pursuing a policy of improving the quality of life of all Malaysians. It is doing so through wider investment and employment opportunities, higher productivity and the provision of a broad range of social services, including education, training facilities, housing, water supply, electricity, sanitation, medical services and recreational opportunities, and through enhancing the quality of the physical environment.

The intention of this article is to make an urgent appeal for the commitment necessary to maintain the natural environment through proper management. Environmental management seeks to reduce pollution and, more importantly, to maintain our resources through controlled productivity directed towards providing a general quality of life.

Several kinds of problems and issues arise from activities such as land development, electrification, industrialization, resettlement programmes, urbanization, social reforms, exploitation of natural resources and the energy crisis.

Regional land development is being carried out on a large scale in the Malaysian Peninsula and several large projects located primarily on agricultural land are now well under way. There is no doubt that projects involving extensive forest clearance, landscaping, road and town construction and agricultural planting will affect the environment to a major extent. At the same time about a fifth of development expenditure by the government helps to increase productivity through rubber replanting, double cropping, infrastructure development and social services. So the allocation of resources is only the beginning of serious social problems.

As man's most basic needs are satisfied, other needs arise. The satisfaction of these more complex and diverse needs requires greater control and efficiency, achieved through continued specialization and the evolution of technology. Industrialization has brought economic and social benefits to Malaysians, but it has introduced large quantities of organic and inorganic waste into the aquatic environment.

The energy issue is one of several that has emerged in recent years in the wake of national development programmes. What is significant about it is that past consumption rates of oil, information on known energy reserves, soaring production and distribution costs, and consumer reaction have made uncertain the continued use of oil as the main source of energy. The search for alternative sources of energy could affect the environment if not done with care.

There is a grave threat to forests and their wildlife. In August 1977, the *New Straits Times* said, "Uncontrolled exploitation of forests would deplete the nation's timber resources in twelve years. . ."

In developing countries, the conflict between economic development and environmental pollution is not easily resolved, especially when development can lead to more employment opportunities and to a higher economic standard of living. Competition, cost considerations and the need to accelerate industrial development have led to the use of the cheapest means of waste disposal, with little regard to environmental side-effects.

The technology which has made industrial development possible must now be used to control, recover and recycle waste material. If this is done, developing countries can achieve their industrial ambitions without repeating mistakes made by industrial nations. Natural resources are not replaceable, nor are they readily substituted for.

Major environmental actions

In Malaysia today, development is carried out with a new respect for the environment. The aim is two-fold: to prevent the depletion of natural resources so that they can continue to provide for economic growth, and to give adequate warning of the side-effects of development activities.

Measures have already been introduced by the government to protect and conserve the environment. Among these is the 1972 Protection of Wildlife Act, which states that totally-protected animals shall not be shot, killed, taken or kept by anyone except with a permit from the Ministry of Science, Technology and the Environment. The 1974 Environment Quality Act, among other things, controls building and commercial activity in residential areas.

In regional land development programmes in Malaysia an initial assessment of environmental impact is made in an attempt to reduce undesirable secondary effects. This is the first step in the development of an environment management procedure for such projects. The development of forest resources in Malaysia is now being regulated by careful management to ensure environmentally safe, sustained yields. Citizen's groups and other environmental societies are playing a bigger role by voicing their opinions in local newspapers and through discussion groups, seminars, exhibitions and campaigns.

Curriculum development in environmental education

Curriculum development is no longer merely subject-based, but has a much wider application. New disciplines have emerged, and established disciplines can no longer be sharply defined. In curriculum development, therefore, attention is being given to incorporating issues that are of national and local concern.

Many terms are used for environmental education: Outdoor Education, Conservation Education, Environmental Management Education, Community Education. These are often used interchangeably and are a source of confusion. But, according to Swan, "Environmental education is different in that it is concerned with involving people in environmental problem-solving. It makes no claims to making people naturalists."

In Malaysia it is increasingly clear that education has an important role to play in maintaining the quality of life. There is now agreement that the environment embraces social, cultural and physical components. This requires an approach to learning in which young people are able to identify and investigate local problems in their immediate environment—home, neighbourhood or community—and to offer solutions to remedy them.

Environmental education, by its very nature, draws its content from several disciplines and hence an instructional programme development calls for an integrated, transdisciplinary approach based on the total environment which would promote an environmental consciousness in each individual. Within such a framework it is possible to further strengthen and consolidate environmental problems and issues as components of the science and social studies curriculum. The role of the teacher is to improve the pupils' perception of the environment by teaching through the exploration of real-life problems and situations in the community, looking first at simple and then complex phenomena in both man-made and natural situations.

As there is no separate subject on Environmental Education in the formal school curriculum, the various subject desciplines of Science and Social Studies at the different grade levels now have environmental objectives in their respective syllabuses. This strategy has been adopted by the Population Education Project of the Curriculum Development Centre. Techniques for introducing environmental concepts into different subjects of the curriculum in Population education are:

1. **Infusion approach.** This approach generally has three stages:
   a) Identification of relevant environment-related concepts and the points in subject disciplines at which these concepts can be infused;
   b) The selection and sequence of appropriate learning units;
   c) The preparation of textual and audio-visual materials for use by classroom teachers.

2. **Integration.** In this approach the relevant population topics are integrated into syllabuses as and when these are revised.

The Population Education Project subscribes to the view that education helps to transmit knowledge and values and, in so doing, prepares the young to face the future. Education is becoming more and more concerned with the development of individuals as responsible and economically productive citizens. As such, education must inculcate in young citizens a sense of responsibility for the future and a commitment to the improvement of the environment.

* * *

The Population Education Project as seen from an environmental point of view claims that pupils will be able to learn about how and why population changes occur and the effects these changes have on the quality of life of the people and the environment they live in. This is necessary to increase pupils' understanding of population-related issues such as employment, industrialization, urbanization, squatter settlements, pollution, housing, education, health services, and the supply of food, water and energy.

The science curriculum

First level. In the primary schools it has been suggested that an integrated approach be adopted involving the environment as the basis of learning. In any given environment the starting point of study may be any object—simple or complex—a social event, a process or a problem about which the children may be naturally curious. The method of study would be through personal observation and involvement with the teacher acting as guide in helping to make the observations comprehensive and imaginative. The process of scientific inquiry would increase their understanding of life around them. They would be required to report what they have explored in order to learn the art of expression and discussion.

Second level. In the secondary schools, it has been recommended to pursue the scientific method in greater depth. The topic selected would be taught as a set of problems. This is a functional approach using the scientific method of looking at complex phenomena involving man-made

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and natural situations; it calls for an understanding of inter-relationships in nature.

At the lower secondary stage the Integrated Science programme stresses conceptual understanding. Implied in this is the application of acquired knowledge and skills to real-life situations. In the General Science, Physics, Chemistry and Biology syllabuses, the teaching and learning approaches are designed to improve the understanding of concepts and principles in science through supervised activities related to selected situations.

Content organization

As a response to the developmental needs of the country, the curriculum content has had to address itself to certain problems and needs as they are found in the physical, cultural and socio-economic environment.

Primary school level. The primary science curriculum continues to concentrate on key concepts such as plants and how they adapt themselves to the environment, types of plants, life cycles and the economic importance of agriculture. Around these concepts an environmental awareness is expected to be built up.

Lower-secondary stage--Integrated Science. The integrated science course breaks down the arbitary divisions of the natural sciences, stressing inter-relationships. It attempts to link science education with practical application and the use of environmental resource elements as well as the introduction of human concerns. Two of the issues that are discussed in the present science curriculum are effects of air pollution on man, and safety precautions in the home.

Upper-secondary stage. Here a General Science syllabus subscribes to a similar kind of integration. It stresses understanding of basic scientific concepts in relation to the pupils' environment and the application to everyday situations. The General Science syllabus deals with such big issues as the difficult disposal of radioactive chemical waste, the relationship between smoking and lung cancer, and the threat to the nitrogen cycle posed by intensive farming.

The single-subject disciplines. The Physics, Chemistry and Biology syllabuses, though specialized and academic, do emphasize understanding of scientific concepts in relation to the pupils' environment and the application of these concepts to everyday situations.

Through both the General Science and Physics syllabuses, pupils are made to examine data on, for instance, the effects of atmospheric impurities on lungs, hydro-electric power, nuclear fission and fusion, pollution and depletion of natural resources. In the Physics syllabus, world energy sources, the circumstances of the energy shortage and its possible effects on our way of life, and the efficient use and conservation of energy are aspects of one big environmental issue that is being studied.

In the Chemistry syllabus some of the issues discussed are air pollution and the world's climatological changes, water pollution and its effects on plants and animals, and transportation of fuels and wastes. In the Biology syllabus several issues commonly incorporated are ways of meeting the energy needs of the world's expanding population, effects of sound and pollution brought about by the impact of industrialization on the health of man, food production through efficient agricultural practices, the need for change in eating habits, and control of urban sprawl.

Environmental activities

Traditionally the study of ecological relationships has focused mainly on population and communities of organisms and the physical and chemical elements with which they interact. But much is yet to be done towards the general concept embracing human activities based on the premise that environmental concerns are an interwoven web of both economic and social problems. An ecological approach to studying the problems can help to enhance the realization of developmental goals and anticipate the effects of development activities on natural resources and the various processes in the environment. It is not possible to consider relationships between organisms without considering the environment and studying the living organisms in both their natural and man-made environments. This increase in awareness of the role of ecology in society is becoming an important objective of science education in Malaysia.

An extension of formal exposure to problem-solving in real-life situations can increase the transfer value outside the classroom. A move in this direction already exists in the numerous projects pupils undertake to do in preparation for the National Science Exhibitions. This is a non-formal component of science within the formal system. Other out-of-school environmental education programmes have been developed for young people and adults. These, briefly described below, serve to complement formal education.

Science exhibitions. Schools are being encouraged to undertake short- and long-term projects through informal activities aimed at solving local community problems or improving upon existing practices in agriculture, small-scale manufacture, personal hygiene and community health—as well as in the management of energy resources and the environment. To focus attention on such activities and to encourage participation, the Ministry of Education, jointly with local industries, organizes regular science exhibitions for secondary schools. In this context, schools are encouraged to work on short-term projects that are of community and scientific interest and to regard the exhibitions as channels for displaying and disseminating their findings on a large number of environment-related projects.

Long-term project work. Investigatory long-term project activities in and out of school are becoming increasingly popular with school science clubs, and the television series "Young Scientist" highlights selected projects on television. The television crew visit participating schools and cover the project more thoroughly than would be possible in an exhibition. The televised project is judged by a panel of experts who offer suggestions for further improvements. Many of these projects are often on environment-related topics and the television programme creates awareness and interest among both schoolchildren and adult population.

Nature Study Centre. The Department of Wildlife and National Parks, in co-operation with the Ministry of Education, has set up in Taman Negara a "live-in" Nature Study Centre for students. The centre is surrounded by the natural sights and sounds of the forests. The only access is by river or jungle paths. There is accommodation for about 50 people.

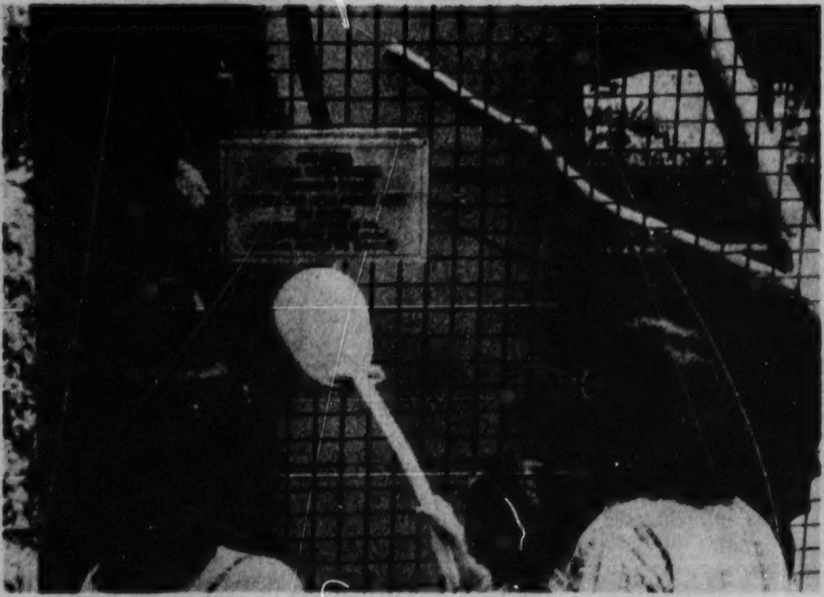
The centre conducts special programmes for students during school holidays. It also allows teachers, college lecturers and university staff to conduct their own programmes. The special activities include map-reading and jungle orientation by compass. For this purpose, loop trails have been cut, each passing through distinctive vegetation such as secondary scrub and riverside forests. Experienced Park Rangers are on hand to guide participants, who have the opportunity to appreciate nature, learn new skills and exchange ideas with students from other parts of the country.

Group training programmes. The Wildlife and Nature Protection Department organizes group environmental training programmes in the Templer Park Reserve Forest in the state of Selangor.

Zoo Negara Education Centre. The Zoo Negara Education Centre is a self-contained unit of the Malaysian Zoological Society.

Principle functions in brief

1. To develop the educational potential of the National Zoo and the National Aquarium by conducting educational programmes and by providing interpretive services for zoo visitors, and
2. To establish and maintain a permanent educational display.



Some supportive functions

1. To build up a library of educational material for use in zoo education programmes and for reference,
2. To conduct courses for National Zoo staff, for schoolteachers or for the public, and to provide educational services outside the zoo,
3. To make contact with schools and other educational institutions to publicize the centre's education programmes, and
4. To co-operate with other organizations involved in environmental education, both in Malaysia and overseas.

Special services

1. Environmental education for school groups:
    a) To encourage appreciation and understanding of the animals on display and of their natural habits and life styles;
    b) To foster the development of respect for wildlife;
    c) To show the interdependence between wildlife and its environment;
    d) To demonstrate man's dependence on nature for his survival;

e) To show how man alone can make major and long-lasting changes to the environment, and

f) To demonstrate the value of good planning in making decisions affecting the environment.

2. Interpretative services for general visitors, to encourage an appreciation and understanding of the animals on display and of their natural habitats and life styles.

Field study centre. The University of Malaya Field Study Centre at Ulu Gombak Selangor covers 313 acres. It was opened in 1965 with money provided by the Nuffield Foundation of Great Britain to help the teaching and research departments of the University of Malaya and other local and foreign universities, including those in Singapore and Hong Kong. Now the centre also offers its facilities and services to schools and other organized groups. The centre has a laboratory and a hostel for 30 people. Its purposes include the following:

1. To help research in field studies, particularly in ecology, biology and wildlife;
2. To help the teaching of techniques for ecological studies through programmes organized by the centre staff, who are normally university lecturers;
3. To help schoolteachers to organize ecology classes and environmental field trips and to be involved in helping in the Curriculum Development Centre's in-service programmes; and
4. To create interest and awareness in the natural environment—especially forest resources—among the public.

Mass media. Information about the environment and its problems is usually provided by the mass media. Periodicals on environmental education for the public are growing in number, and newsletters and articles are published by various organizations and pressure groups.

Seminars and lectures are organized by government departments, universities and private organizations. These draw large audiences and are given press coverage as well. Television and radio programmes are occasionally devoted to environmental topics. Despite all of these efforts, however, much still has to be done to create environmental awareness among schoolchildren and the public.

Use of local expertise. The Malayan Nature Society and the Curriculum Development Centre are jointly developing resource materials which include environmental topics in the school curriculum. An important aspect of this work is to introduce a Malaysian identity into related subjects by using Malaysian examples.

Community development and the schools

The government is trying to improve economic, social and cultural conditions in rural communities and to help the people take part in and contribute to national programmes. It is realized that this work needs the co-operation of the private sector. Education, both formal and informal, contributes to community development. Schools can help by teaching the skills and attitudes which enable people to further their productivity and well-being. The school and its staff can also join in the community's activities directly.

Agricultural science education. The Ministry of Education is strengthening agricultural science education which was introduced as a subject in lower secondary schools in 1965.

Health and nutrition education. In 1968 the Ministry of Education and the Ministry of Health launched a joint school health programme to protect and promote the health of pupils and school staff. These efforts normally take into consideration the health of the community and so involve the school in the community, particularly in such services as maternal and child health, sanitation, control of contagious diseases, health education and general health care and services.

National Applied Food and Nutrition Project. One of the main objectives of this project is to instil a sense of self-reliance and commitment to improving the quality of life in the people especially those in the rural areas. The Ministry of Education plays a major part in the project. Its main contributions are:

1. A gigantic supplementary feeding scheme for 400,000 school children;
2. Agricultural activities in schools which include food crop and vegetable gardening, fish cultivation and poultry, and
3. Health and nutrition education and home science in schools.

Pahang Tenggara Curriculum Project. This is an experimental curriculum for the Pahang Tenggara Development Project, a massive rural resettlement programme. One of the objectives of the project is to anticipate and analyse social, economic and cultural changes in the Pahang Tenggara area. These changes are reflected in the curriculum specifications making it relevant to the pupils' environment and educational needs while taking care not to alienate it from the National System of education.

In Pahang Tenggara the educational programme calls for the possible integration of primary schools with lower secondary schools and for co-operation between the school and the community in formal and non-formal education from the fifth year on. A sensible feature of schooling in Pahang Tenggara is the blending of formal education with vocational training, to help school-leavers find work, particularly at the end of the ninth year. Pupils in lower secondary school go out to industry for part-time job training. The objective at Pahang Tenggara is to make the nine years of schooling a continuous programme of basic education.

Teacher education

Increasing concern with teaching environment-linked subjects and encouraging awareness of the environmental problems and issues raised by man's interference with the environment has created a need for effective new training programmes for teachers, both pre-service and in-service.

Pre-service training. In Malaysia the pre-service education of teachers is carried out by teacher-training colleges and the faculties of education in universities. Although the teacher-training college syllabus depends on the school syllabus lecturers have been allowed flexibility in following and interpreting it. The objectives of the syllabus state the need to relate science to real life but this has to be made explicit. Reform of the teacher-training programme from a two-year course to a three-year course and the possible inclusion of Environmental Education as a separate subject are planned.

In-service training. In Malaysia there are various means by which teachers are normally provided with in-service training:

Face-to-face

The in-service courses conducted by the Schools Division of the Ministry of Education are usually planned and carried out nationally or regionally. The objective of such courses is to show teachers the new approach to curriculum development and the method of teaching the new programme. These courses are conducted by staff trained by the Curriculum Development Centre, and in some instances with the use of local expertise. The methods used are face-to-face training in Social Studies and face-to-face and practicum in the Sciences. The system of training at the Curriculum Development Centre is to prepare a cadre of lecturers able to conduct in-service courses in their regions. The courses normally last one week, and cover a variety of topics such as teaching and learning techniques; questioning techniques; techniques for writing test-items; laboratory organization; techniques in teaching environment-related topics linked to real-life situations; the rationale, aims and objectives of the new course; use of scientific terms in Bahasa Malaysia and techniques in conducting in-service courses.

Self-instruction

In the search for an efficient way of keeping the heads of schools and the teachers informed about population-related issues and problems, the

Population Education Unit of the Curriculum Development Centre has embarked on a teacher-orientation programme using self-learning modules (SLEM). It has developed seven modules:

a) Population change—its determinants and consequences,
b) The population situation in the world and in Malaysia,
c) Population programmes in Malaysia,
d) *Population and Environment,*
e) *Population and Resources,*
f) Population and social services, and
g) *Population and the Quality of Life.*

The SLEM programme focuses on population concepts which are in the school syllabuses. The modules on 'Population and Environment' and 'Population and Resources' deal with effects on the environment of rapidly growing population, and the need for management and conservation of resources. Of special interest is the module on 'Population and Quality of Life'. The SLEM teacher-orientation programme is a school-based activity, with heads of schools serving as course managers. Each module is self-contained with the objectives clearly laid out. The modules are interrelated and learning activities can be carried out individually.

In-service training linked to community and national development

Agricultural science teachers have been trained by a mobile-in-service unit which is an extension of a project to train teachers at Temenggong Ibrahim Teachers College in Johor Baru, Malaysia. The mobile unit organizes and conducts workshops for trained teachers of agricultural science at district level during weekends, usually using a school as the course centre.

Innovative efforts at in-service training in science

The limited availability of research findings on how to teach science in the context of current environmental problems has been the main problem of developers of training programmes for science teachers. An in-service training session for Key Personnel held recently at the Curriculum Development Centre utilized a Research-Development-Training Model. The session was held at the Field Study Centre, Gombak. The participants had at their disposal the following habitats for study:

– a clean, undisturbed stream,

– a highly silted river,

– a primary forest, and

– a secondary or early successional forest.

It was proposed that the participants of the course be trained in assessing water quality and its effects on plant and animal life in water. Also to be studied were the accompanying effects of logging or road construction on changes in the flora and fauna. Data on the selected physical and chemical parameters were related to the biological community that existed in the selected areas. Discussions from this study gave insights on the functioning of each habitat as well as the effects of man's activity on it. Photos taken during the course appear on the facing page.

Present curricular efforts at the Curriculum Development Centre in Malaysia are at different stages of development for the different subject areas. In the school curricula it is being recognized that environmental considerations are to be approached as being multidisciplinary. The science curricula which are now being reviewed have a particularly important contribution to make towards environmental education. In this review of the science curricula greater consideration will be given to the incorporation of environmental issues. In other subject areas such as the Social Studies a similar approach to issues is being attempted.

Selected references

Cheney, B. Philip. *Environmental screening in Regional Land Development.* Seminar Kebangsaan Pengurusan Alam Sekitar dan Penilaian Kesan-Kesan Alam Sekitar, 16-20 October 1978.

Chelladurai N. *Developing an in-service programme for science key-personnel to expose them to teaching science in the context of current environmental problems–a Malaysian case study.* Paper submitted for the CASME Awards, 1980.

Malaysia Plan, First (1965-1970). Kuala Lumpur, Government Printers, 1965.

Malaysia Plan, Second (1971-1975). Kuala Lumpur, Government Printers, 1971.

Malaysia Plan, Third (1976-1980). Kuala Lumpur, Government Printers, 1976.

Maheswaran A. Department of Environment Malaysia. *Treatment and disposal of industrial effluents: a sensible approach,* March 1977.

Malayan Naturalist, vol. 33, nos. 3 and 4, June 1980.

Mok, S.T. *Impact of forest resources development on the environment in Malaysia.* Paper presented at the National Seminar on Environmental Management and Environmental Impact Assessment, Kuala Lumpur, 16-20 October 1978.

Swan J. *The challenge of environmental education.* Phi Delta Kappan, September 1969. p. 27-28.

Zoo Negara Education Centre Paper, 1979

Activities at the Field Studies Centre

Above: *Measuring some physical/chemical parameters;* **Right:** *Collecting aquatic organisms;* **Below:** *Examining their catch.*

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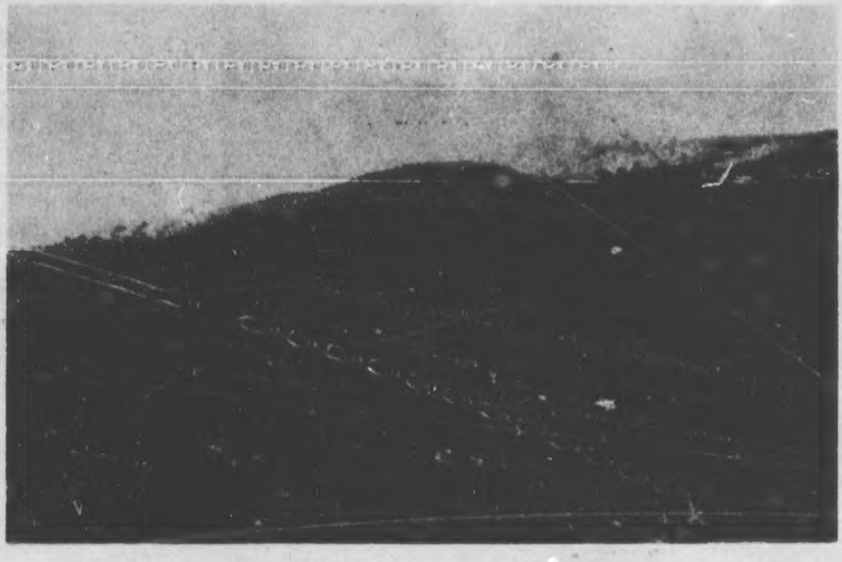
NEPAL

By B.P. Lohani

Development and the environment

Development in the past meant economic development only, and implied the maximum exploitation of natural resources. This trend often resulted in ecological imbalance and threatened the very existence of human life. Nepal has since come to realize the urgency of conserving nature and the environment and hence the country's effort has been to work for *total* development which encompasses social, cultural, educational and environmental aspects as well.

In Nepal, wood is a principal fuel and a huge part of the forest land has been cleared for firewood. The forest has been cleared to plant crops also. These and the lack of balance cutting and regrowth have resulted in extremely heavy destruction of forest and, as a result, the forest coverage throughout the country has diminished greatly.



Page 116: *A plantation in the Kathmandu valley–reforestation begins to cover the nearly bald hills.* **Above:** *Deforestation in a mountainous region–the makings of soil erosion.*

Another, connected, problem is that of soil erosion which is very serious in the heavily settled midland hills of the country. Every year millions of tons of topsoil are washed down to the sea.

Nepal has also a problem of new human settlements arising out of the large-scale migration of population from the heavily settled midland hills to the plains (Terai).

Thus, the principal environmental problems are as follows:

1. Deforestation,
2. Soil erosion,
3. New human settlements, and
4. Water and air pollution.

Major environmental action

His Majesty's Government of Nepal is aware of worsening environmental conditions and has taken corrective measures with all seriousness in order to prevent the situation from deteriorating even further. Some of the measures being carried out to help preserve the natural heritage are given in the pages that follow.

Legislative sanctions. Legislation has been passed for the protection and enhancement of the environment. This includes laws and acts relating to:

1. Reforestation,
2. Soil and water conservation, and
3. Preservation of the cultural heritage and wildlife.

The provision of legislation should ensure the people's active participation in protecting the forest. The local bodies and the common people are offered a share of the forest produce when they have assisted in promoting forest growth.

Government departments responsible for environmental resources. Forest resource management has been a major concern in the past few years and a long-term forest development programme is worked out by the Ministry of Forests. One of the departments of the Ministry, the Department of Soil Conservation and Watershed Management, has a number of projects of varying dimensions for the conservation of soil and water resources.

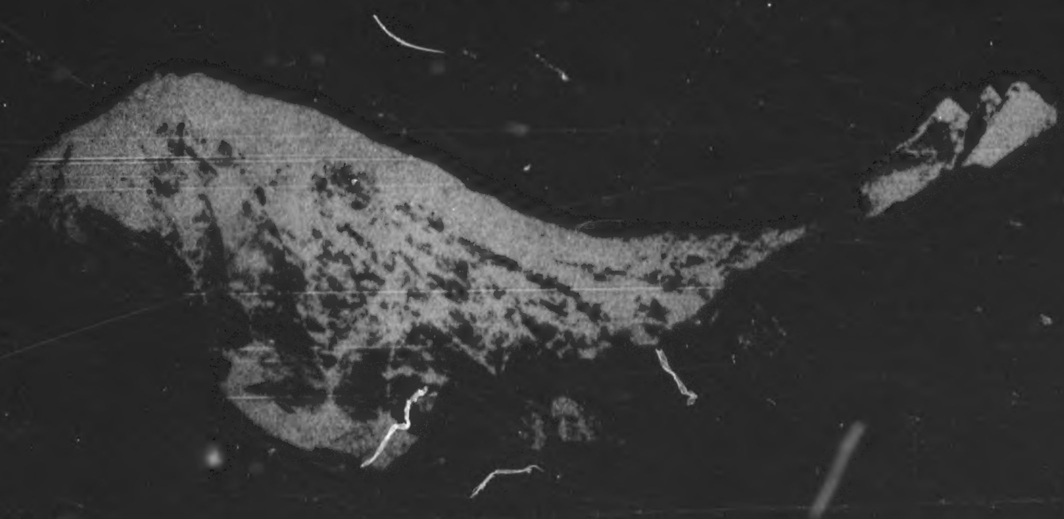
The Department of Archaeology, the *Guthi Sansthan* (a trust for taking care of temples) and the Department of Local Development have all been contributing towards maintaining and renovating works of various temples, monasteries and other monuments of high historical and cultural importance. This is intended to preserve an ecological balance between the private dwellings and monuments.

The Department of National Parks and Wildlife Protection in the Ministry of Forests is responsible for the management of parks and wildlife reserves. Altogether, there are such seven national parks and wildlife reserves in the country.

The Nepal National Committee for Man and the Biosphere. This committee carries out research projects to study local environmental problems and seek solutions thereto.

Integrated development in the mountains. His Majesty's Government of Nepal has decided to set up a regional centre for integrated development in the Southern Asian Mountain System.

Family planning and population education. A three-year project agreement with the United Nations Fund for Population Activities (UNFPA) has recently been approved for the execution of a national population education programme. The project will be implemented by three units: (a) Curriculum, Textbook, Supervision and Development Centre; (b) Tribhuvan University (the Institute of Education and the Curriculum



Langtang National Park, Nepal

Development Centre; and (c) Division of Adult Education. A small unit in the Ministry of Education will look after the administrative and financial matters of the project.

The long-range goal is to institutionalize population education in the formal and non-formal education programmes including the university. This will be achieved by (1) analysing textbooks of different subjects to find points for the integration of population education concepts; (2) developing curriculum, instructional materials and training kits for different audiences; (3) providing orientation training to the project personnel, supervisors and headmasters, primary and secondary school teachers and pre-service and in-service teachers; (4) establishing diploma courses in population education as both separate and interdisciplinary courses at Tribhuvan University; (5) developing graded curricula and materials for non-formal education; and (6) establishing 20 centres for functional literacy and continuing education using population and environmental education resources.

Environmental education

Environmental education is considered as a process for creating awareness of human ecology—humanity's special relationship with nature. It is conducted in Nepal in both in-school and out-of-school programmes. It appears in various forms at all three levels of formal education.

A close-up of replanting with evergreens

In-school programmes. The first level of education, grades I to V, is designed to prepare a child to understand and appreciate the importance of our environment. Environment also forms part of the second-level curriculum (grades VI to X).

Environmental education is integrated into the Science, Health and Social Studies curricula. A regular part of the secondary school extra-curricular activities is the planting of trees. This is intended to support the National Afforestation Programme.

One of the main features of a recent educational reform has been the National Development Service programme at the third level of education. The main objectives of the programme are, first, to allow the students to experience the realities of rural life, thereby making their higher education broader in outlook and better attuned to the real development needs of Nepal, and second, to offer students an opportunity to help in meeting the country's development needs during their academic careers. The programme is an integral part of the degree-level course. Students preparing the service receive orientation in the various activities they are to carry out in rural areas. They receive an initial grant for clothing and other needs, and a monthly allowance for the ten months' service period.

During this service, the students work as teachers in local schools and participate in other rural development activities such as afforestation; health and adult education; agricultural extension; family welfare; and small construction works including water supplies, roads and bridges.

Out-of-school programmes. Radio Nepal broadcasts a regular weekly programme on ecology in general and on protection and preservation of forests and wildlife in particular. Environmental education is also a theme of adult education programmes.

Co-ordination, evaluation and research

The National Planning Commission is responsible for the co-ordination and evaluation of programmes. A few research projects in the search for measures for management and conservation of environment are these:

1. The Lothar river system project,
2. An ecological study of Golabari and its adjoining hills, and
3. Mountain hazard mapping.

These projects are planned and operated by the National Committee for 'Man and the Biosphere' and assisted by United Nations Agencies.

References

National Parks and Wildlife Reserve Act, 1972
Forest Rules, 1978
National Park, Royal Chitawan
" " Sagarmatha
" " Lamtang
" " Rara
Wildlife preserve, Royal Suklaphanta
Wildlife preserve, Royal Karnali
Wildlife preserve, Kosi Tappu ☐

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NEW ZEALAND

by Ian T. Young

Environmental issues and problems

National mandates. In 1972 the government established a permanent commission to investigate and advise on environmental problems and planning issues. This agency, which reports to the Minister of the Environment, is known as the Commission for the Environment. It is staffed by a small team of investigative officers from a wide range of environmental disciplines, plus one full-time officer responsible for environmental education. Since the Commission's establishment, this officer has discussed in-school education with the Department of Education, and has worked with many groups involved in out-of-school education.

The major task of the Commission is to advise on the Environmental Protection and Enhancement Procedures established by the Cabinet in 1974. These ensure that the planning of any major project must include a report on the effect of the proposal on the environment. The Commission carries out an independent audit on this report.

This form of environmental defence is only one of many. All projects also have to meet local city and country by-laws, regulations on water and soil rights and the provisions of the Town and Country Planning Act. To co-ordinate and speed up these procedures, the government passed the National Development Act in 1979. This Act gave the Commissioner for the Environment the right to give evidence independently of the government. To date the Act has not been tested but many of the country's 75 national environmental bodies and many of the 500 local groups have expressed concern that it could mean less protection for the environment. These groups have also criticized what they see as restrictions on access to official information related to environmental issues.

In addition to the Commission, two other bodies have a broad advisory role in relation to environmental policies and management. The Environmental Council, established in 1970, advises the Minister of the Environment on any matters related to the state and trend of the environment. The Nature Conservation Council, established by statute in 1962, is an independent expert advisory body on matters of nature conservation.

The aspirations of the governing National Party in relation to the environment are set out in the 1978 Election Manifesto: "Society's well-being is dependent upon the quality of its environment. New Zealand's natural environment is more than a valuable resource; it constitutes our life blood. National [the National Party] regards environmental care as not an isolated policy, but a way of planning and managing our future."

At present the Organization for Economic Co-operation and Development (OECD) is reviewing New Zealand's environmental policy and management. In preparation for this review, a working document was prepared by the Commission for the Environment and published in February 1980. This part of the report draws on this working document and in doing so it should be recognized that this may not necessarily reflect either government policy or the many environmental interest groups referred to earlier. These views will be taken into account and published at a later date as the OECD review continues.

Major issues and concerns. The main issues as perceived by the Commission are reflected in the table of contents of its working document:

1. Institutional Arrangements
2. Primary Production, (a) Agriculture, (b) Forestry

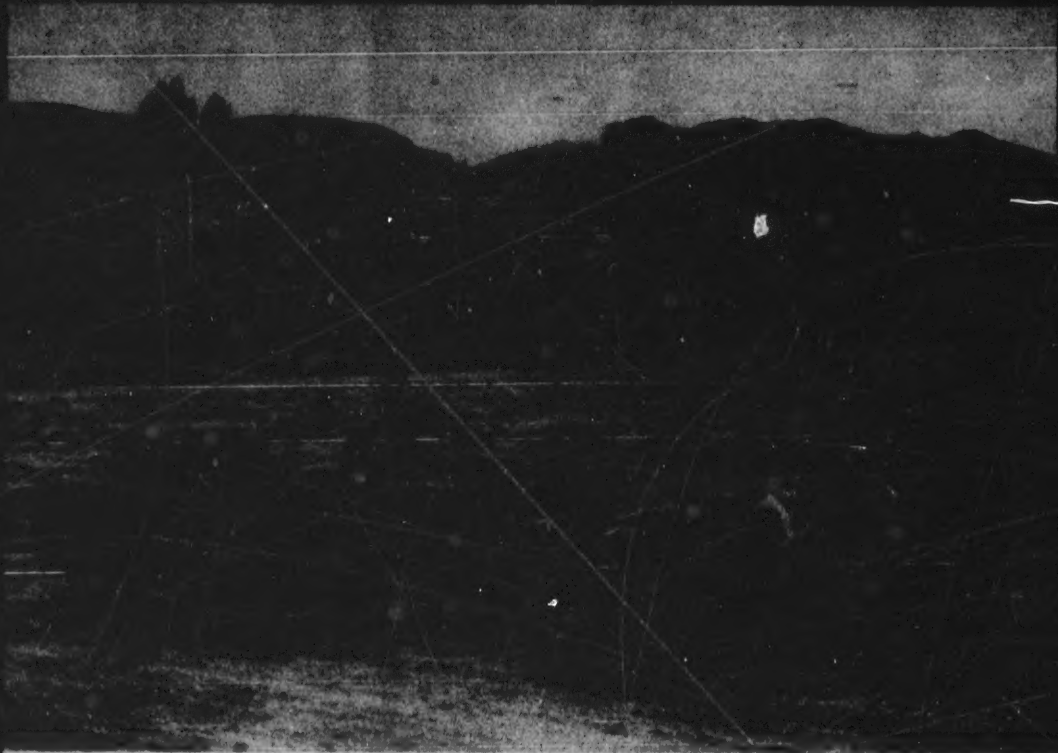
3. Indigenous Energy Resources
4. Water Resources
5. Environmental Health
6. Town and Country Planning.

These issues, then, are those which relate to competing demands for natural resources. For example, should the fresh-water resources in a particular area be used for hydro-electric power development, for irrigation, for waste disposal or recreation, or should they be preserved as a natural wildlife reserve? Some of these uses may be compatible but, even within one particular form of use, there may be further conflict. There may be conflicts within recreation, for instance, between those who want the fresh-water area for power-boating and those who want to preserve it in a semi-natural state for fishing.

These issues and concerns may differ greatly in scale. On the smallest scale, local people may be concerned about the use of a particular pond; on a moderate scale, people in a large city may have mixed concerns about the possibility of extending an airport into a harbour area or a high-density suburban area. On a larger scale there are a number of concerns which not only affect the people in that area, but also have effects throughout the country and beyond. These concerns usually relate to the possibility of considerable changes in the natural habitat of an area to satisfy the economic demands of the nation. One such concern relating to various areas of New Zealand is the cutting down of indigenous forests for economic use and replacing them with exotic forests—if they are replaced at all.

Currently, most of the controversial issues relate to the development of New Zealand's energy resources. Though low in liquid fuels, New Zealand is well endowed with other resources such as hydro-electric power, coal and natural gas. In order to halt the decline in a standard of living based on high use of energy it has been decided that energy development schemes must be given priority. This has been accepted by many people, but others believe that it is the wrong direction for the future. Of those who reject the policy, some do so for economic reasons while others do so from a concern that there may be short-term economic gain for long-term environmental despoliation.

Environmental actions. The work of government agencies has been discussed above. Outside the government's formal and semi-formal institutions there are a number of groups with varying concerns about the environment. At the national level there are general interest groups such as the National Geography Committee of the Royal Society, which considers the environment as an interacting geosystem and directs its submissions to



the government accordingly. There are also special-interest groups such as Ducks Unlimited Incorporated, which is concerned with the preservation of wild ducks. The 75 national groups and 500 local and regional groups have been listed by the Environmental Council in an Environmental Directory, published in 1979. Whereas many of the groups have plans for the future protection and enhancement of the environment, many are formed in reaction to particular proposals which may threaten the environment at any scale from local to national.

In the formal sense of adopting policies on the environment, the educational system has been slow to respond. At the practical level, nevertheless, in classrooms and field studies, schools have moved rapidly to use material made available by environmental groups in their existing programmes. In fact, so rapid has been this move to study the environmental issues being debated publicly that there has, as in the studies of pollution, been a degree of backlash, with a fall in pupil interest and a call from some segments of society for a return to the often-quoted basics of reading, writing and arithmetic.

Curriculum development

Definition and scope of environmental education. As this is written, there is no single accepted definition of environmental education but those in use share these ideas: concern for the total environment, including natural and cultural aspects and their relationships, concern for promoting knowledge of the environment, interest in environmental issues and responsibility for resolving these issues.

These common ideas can be seen in the following definitions, both of which have had some use in New Zealand. Ray Chapman-Taylor, in his review of Education and National Parks, 1976, defined environmental education as: ". . . the use of the whole curriculum to focus attention on environmental problems and values, with the intention of producing good citizens who are interested, informed and responsible in environmental matters."

The Joint Centre for Environmental Studies, in its research survey paper of 1980, offered the definition: "Environmental education aims to produce a society that is knowledgeable concerning the total environment and its associated problems, aware of how to help solve the problems, and motivated to work towards their solution." Whereas Taylor's definition focuses on the school setting, the definition by the Joint Centre is broader and is accepted by the Commission for the Environment, concerned as it is with education outside of school.

Currently, within the Department of Education, serious attention is being given to exploring the nature of a common core of education for all pupils. One of the areas being considered is that of environmental education, not as a new subject, but as a means of ensuring a commonly accepted set of aims.

Objectives and concept maps. By the time this journal is in print, it is expected that a working set of objectives for environmental education will be agreed upon for use in schools. Many subjects now have objectives relating to environmental education but they have not been considered in overall perspective.

The primary school science syllabus, which is for children in their first to sixth years at school, sets out to develop a child with an "inquiring mind and the skills for exploring and interpreting his biological and physical environment. Within these general objectives there are specific ones which relate to knowledge of many of the facts of the environment, understanding of such basic concepts as energy and life, the development of observing and measuring, the ability to communicate through language and drawings and the development of attitudes of curiosity, honesty, the care of living things and the care of the environment."

Similar objectives are found in the science syllabus for 12-15-year-old students but with the addition of such objectives as developing a

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willingness to apply scientific skills, to accept a responsible attitude towards plants and animals and to accept a responsible attitude towards the relationship between man and his environment.

These latter objectives are clearly consonant with those found in the draft national guidelines for geography which is taught in the senior part of secondary school. "Geography is the study of the environment as the home of people and shares with related subjects a concern for environmental questions and their solutions. It is concerned with understanding environmental phenomena, their origins and characteristics, and their implications for individuals and groups in society. Geography's integrated approach fosters a . . . respect for the total environment. . ."

There have been attempts to develop concept maps from the most junior level of primary school to the most senior level of the secondary school. Table 1 (p.128) is such a hierarchy, developed by a working party set up within the Department of Education to study environmental and outdoor education. Members of the working party encompassed subject interests in science, social studies, art, health and physical education, outdoor pursuits, geography and received suggestions from teachers, inspectors and many groups in the community. Table 2 (p.129) is an outline of the substance of environmental education as it stood in 1980.

Whereas the objectives of environmental education for in-school programmes have not been fully clarified, the Commission has accepted as objectives that out-of-school environmental education should aim toward:

1. A clear understanding that all people are inseparable parts of a system, consisting of humans, culture, our social system, our economic system; and the total environment;
2. A broad understanding of the environment, both natural and man-made, and the ways in which it serves society;
3. A fundamental understanding of the environmental problems confronting the country, how these problems can be solved, and the need for New Zealanders to work towards their solution.
4. A concern for environment that will motivate people to find solutions for existing problems and prevent new ones from arising.

In a bulletin shortly to be produced by the Department of Education, there will be set out the philosophy of education outside the classroom, along with a range of school programmes, many of which highlight studies of the environment occurring in outdoor settings. These studies resulted from a questionnaire sent to schools inquiring about the activities carried

Table 1. A concept map: Aims and objectives of environmental education stated in conceptual terms

		Personal Development	Social Relations	Environmental Perceptions
	Identification	of one's place, capabilities, limitations, responsibility, values.	of roles and nature of group dynamics; of pattern of social behaviour.	of elements (and patterns) in different environments.
	Perception	of environmental uses, aesthetics, concerns, values.	of one's role in groups.	of environments and people's use of and feelings toward them.
Awareness	**Interdependence**	between ability and aspiration.	between members of a group—responsibilities, etc.	of elements in and between different environments.
Understanding	**Interaction**	between growth and skills; between abilities and limitations.	between people.	between elements of environment; between differing environments; between differing uses of an environment.
	Caring	for oneself and one's actions.	for others' feelings, values, actions; for one's role in groups.	for the total environment and for elements in it.
Concern	**Controls**	imposed by personal limitations.	imposed by group conformity.	influencing the attitudes and actions of people toward the environment.
Involvement	**Change**	in awareness of personality; in skills and abilities.	in roles, complexity, etc., in groups.	within environments, in people's attitudes and actions towards environment.
	Challenges	extending one's abilities and involvement.	that foster lasting relationships.	that face people in the development and maintenance of environment.

Table 2. Outline of environmental education in New Zealand schools

	Nature Study	Environmental Processes	Pollution	Resource Depletion	Conservation Skills	Gardening, Animal Studies	Polynesian Perspectives	Mapping	Weather	Land Use	Land Formation
Junior Primary	Names	Living things all around (diversity)	Tidy school environment		Demonstrating concern for preservation of living things and natural environment	School gardens, care of domesticated animals	Legends, myths about New Zealand, places plants, animals. Traditional uses	Local district	Comparisons—fine, sunny, etc.	Immediate location—patterns	Recognition and basic vocabulary
Middle Primary	Names and habitats	Basic requirements of living things	Where do things come from, and where do they go?					Position in relation to others	Observation	Extended district—patterns, reasons	Evolution of land forms
Forms 1-2	Names, habitats, interdependence	Community organization	Pollution problems, Descriptive treatment, Recycling						Formation and recording	National and international adaptation	
Junior Secondary	Tropic relationships, community organization	Ecosystem concept, photosynthesis, respiration	Local case studies and solutions, analytical treatment	Resources from the earth and their uses, Recycling	Case studies and environmental exploitation and its consequences		Polynesian groups in New Zealand cities and controls affecting them	Elementary map interpretation—map related to the ground		Changing land use patterns, Urban studies	Earth science studies, Processes at work, Study of major features
Senior Secondary	Adaptation (as the product of evaluation)	Succession, biogeochemical cycles	Global pollution problems—strategies for survival	Global resource depletion—population consequences, Energy	Evaluate proposals for environmental modification			Map interpretation, Cross section, Compass and orienting, Land use, Surveying, simple map-making	Elements and controls, Measurements—simple meteorological stations	Land use pattern, Conflicts and alternatives, Urban and rural models	Land form studies, Inter-relationships, Systems and processes, Evolutionary theories

out under the headings of Outdoor Education and Environmental Education. The information gathered indicated that such activities were far more widespread than had commonly been thought but that students often took part in out-of-school activities in the rural environment for the purpose of developing social and recreational skills, and frequently *failing to understand and care for the environment in which they found themselves* (emphasis added–*Ed.*).

Strategies for introducing environmental education. Out-of-school programmes in environmental education had often been initiated by the environmental groups, supported both by the general public and large organizations, either commercial or government-sponsored. For example, some of the large oil companies make grants available for environmental projects on an annual basis as does the Environmental Council. The Commission, the Ministry of Works and Development, the Lands and Survey Department and the Ministry of Energy also support a number of projects. Associations such as the Environment and Conservation Organization of New Zealand, the Friends of the Earth and the National Save Manapouri Campaign have all mounted national campaigns designed to educate and persuade people to act upon environmental concerns. Although there is no one co-ordinating agency for out-of-school programmes, the education officers in the Commission for the Environment come closest to fulfilling that function.

Programmes within schools have benefited from the inflow from the community sector. It has been suggested that by not being co-ordinated centrally, subjects and school programmes have developed a flexibility best suited to their needs rather than being directed to a particular course of action from a central co-ordinating group. The Department of Education thinks, however, that such an approach may miss out on many opportunities and leave many gaps in a pupil's education about and for the environment and has sponsored a study by J.M. Renner of the pupils' perceptions, understandings and interests in relation to environmental education.

The Department is also involved in establishing a co-operative investigation of environmental education for New Zealand schools. This co-operative venture between the department, the Commission and the Joint Centre for Environmental Studies follows the general outline of a 1977 curriculum plan. The investigation gains by the addition of an account of world trends and specific overseas projects in environmental education which may have implications for New Zealand.

Research during 1981 will focus on the extent to which objectives are being achieved in existing programmes, or may be achieved,in curriculum areas currently undergoing development. The investigation will also identify inadequacies as well as determining the need for further integration. During 1982 it is expected that the investigation will concentrate upon the evaluation of teaching practices and materials relevant to achieving the aims of environmental education at the various levels of the school system.

Preparation of instructional materials. The foregoing outline indicates that there is no overall co-ordinated approach to the preparation of curriculum and instructional materials for environmental education. Many materials used in schools are prepared by outside voluntary agencies, others are prepared by commercial publishers and some are prepared by Government departments and agencies.

Within the Department of Education, the School Publications Branch prepares a number of school journals and bulletins issued free to primary and secondary schools. Another unit concentrates on the production of filmstrips and overhead projector transparencies. The National Film Library of the Department of Education lends to schools at very economieal rates a range of films and tape recordings that may be relevant to environmental education.

On occasion, materials are prepared on a co-operative basis between the Department of Education and other groups. An environmental planning kit currently under way is a co-operative exercise between the Department, the Ministry of Works and Development, and the Commission for the Environment. The aim of this kit is to assist [urban] pupils to develop a critical awareness of their environment, to understand the changes taking place and to be aware of their causes. This will lead pupils to an understanding of what planners are trying to do in New Zealand, and will also illustrate to pupils that they, as citizens, can participate in the process of designing the environment of the future by actually taking part in the planning process. The items will be particularly suited to the social studies and geography curricula but will also have application to other subjects such as the earth sciences, biology, art and design. Items which are currently being assembled and packaged for distribution to schools include:

1. A chart illustrating in graphic form the town-planning process of citizenship involvement;
2. A booklet entitled *Town planning and you*;
3. A booklet entitled *Walking around town*;
4. A suburban development plan which will involve students in a planning exercise;
5. A film list of town planning and environmental films; and
6. Teacher guidelines for using the kit.

A further kit is already in an advanced state of preparation and will consist of materials relating to urban renewal schemes, the natural hazard of coastal erosion, housing styles over the years, and an exercise for involving students in planning their own environment. A third kit will consist of a comprehensive collection of items relating to one of the major regional schemes of national significance such as the Clutha Valley scheme for hydro-electric development.

Learner activities. It is understood that the learner will be engaged in a range of activities from note-copying and lectures, through question-and-answer sessions, to decision-making and problem-solving activities. It is hoped that all of these activities will involve student inquiry, active thinking and questioning.

If children cannot actively be engaged in the real environment, then whenever possible the environment should be brought into the classroom through the use of audio-visual materials. The use of field work in geography is an indication within one subject of the desire to make use of experiences outside the classroom for studies that relate to the environment. It

is because of the recognition of the value of out-of-class experiences that the Department of Education is preparing its bulletin on education outside the classroom.

One of the more significant indicators of changing attitudes towards environmental education has been the setting up of field centres throughout New Zealand. Some of these centres are converted rural schools, others are new buildings. Many were funded by local teachers, parents and pupils. Thousands of New Zealand pupils, primary and secondary, now undergo environmental education at these centres.

Procedure for curriculum development. For many years a loose form of co-operation has existed between the Department of Education and the groups producing materials for schools and the general public. On occasion, projects of common interest have been established, such as the establishment of a co-operative exercise between the Department of Education and the Commission for the Future which resulted in the production and distribution to all secondary schools of a game entitled The New Zealand Futures Game. A further co-operative exercise is one between the Ministry of Energy and the Department of Education for the production of classroom materials and explanatory teaching notes that relate energy matters to various curriculum areas. Currently, working parties are producing materials for use in the primary school integrated curriculum, secondary science, home economics and geography.

Within the Department of Education's development directorate there is a resources division, recently established to co-ordinate the work of School Publications, Visual Production and the National Film Library. These units work with the curriculum officers, advisers and selected teachers responsible for various subjects, to see that the materials fit the objectives of any particular subject course.

Most of the development in recent years has occurred within the existing subject structures; it has been recognized that the establishment of a new subject, such as environmental studies, would in time set up its own boundaries and would not necessarily be any more inquiry-based or field-based than what is already occurring in science and geography.

This subject approach has meant, therefore, that although there have been forms of co-operation in an attempt to establish and oversee environmental education, there has not been the funding to establish a special unit.

Teacher education

Many educationists and teachers would argue that programmes of teacher-education for courses in environmental studies should be basically the same as for teaching any subject. While agreeing with the generalities, others would say that there are varying degrees of emphasis in environmental education programmes. Inquiry and field experience are examples. Both primary and secondary teachers' colleges offer major and minor courses which take these differences into account. Sometimes they are incorporated into the subjects themselves, but on other occasions a separate course is held under the general title of Outdoor Education.

A range of in-service educational opportunities is available to New Zealand teachers. They can, with the permission of their principal, arrange to have a special one-day course in any topic that they wish to focus on during the academic year. They can also apply to their local district committee for special courses which may make use of speakers from other schools or from the general community. They may be invited to attend national conferences or may request a national teachers' refresher course on a particular topic. Such a refresher course has already been held on environmental education and others are expected for the future.

In the primary teachers' colleges there is a need to provide some content teaching for the student teachers. Some colleges group some of their subjects under the rubric of environmental studies while others offer major or minor courses in environmental/outdoor education.

Secondary teachers gain their basic knowledge through university studies. Traditionally this has occurred within the subject disciplines but during the 1970s some integrative studies were established. In 1974 the University of Canterbury set up the Joint Centre of Environmental Studies sponsored by two universities for a post-graduate professional qualification in environmental management. The Universities of Auckland and Otago provided new courses for undergraduates which were widely based, taught by staff from several faculties working as a team and aimed to supplement the traditional subject course work.

Implementation

Co-ordination. As we have seen, mechanisms have been considered for co-ordinating the various programmes of environmental education at the different levels and forms within the system. Some people doubt the validity of co-ordination, which they fear may discourage innovation. Nevertheless, the department and the Commission have made attempts to bring about some co-ordination, because they consider that without it, environmental education may lose more than it will gain. In 1975 they set up a national conference which attempted to tell the various agencies, both government and voluntary, of what was happening in the schools and of what resources would be most applicable to their needs. Since then co-operation has continued on an informal basis, depending both on need and the availability of personnel. Firmer co-ordination should appear as the need becomes more urgent.

Administration/management. Of the special arrangements for environmental education through the mass media, the conservation week campaign has been the most familiar and successful in New Zealand. The independent organizing committee is funded by the Government and arranges publication of a variety of pictures, pamphlets and materials for distribution to public libraries and schools and for use in radio and television broadcasts. The Commission has also been given a special allocation of funds to publicize Arbor Day. This day was originally intended for the planting of trees but it now aims toward improving the environment in every way. The Commission circulates a quarterly newsletter to individuals, groups and libraries, and so acts as a medium for disseminating information.

Schools generally take part in special days and weeks, either by engaging in activities such as clean-up campaigns or planting programmes or by making the theme a special study topic. This usually occurs more in the primary schools where such integrative programmes are more possible than in the secondary schools which are oriented to examinations in the subject areas. Nevertheless, a number of special interest groups in secondary schools reflect the concern shown in the individual subject studies and are taken further by the students in extra-curricular activities.

Evaluation. This is considered a continuing process and reference has been made to a number of evaluation studies that have been or are being carried out. One of these was a study of outdoor education activities in New Zealand's primary and secondary schools. Another was the study of education and the national parks. The last, and perhaps the most comprehensive, is the co-operative exercise between the Commission, the Joint Centre and the Department which is investigating the current state of development of environmental education in New Zealand schools.

Future directions

For both in-school and out-of-school populations, future directions are likely to be strongly influenced by economic trends. During the 1960s and early 1970s the economy of New Zealand was buoyant, growth was considered inevitable and there was a marked shortage of labour. Now the scene has altered dramatically. Commentators claim that the economy is stagnant, real standards of living have declined and the number of unemployed is at its highest since the depression of the 1930s.

Whereas most people earlier accepted the need for environmental management and enhancement many would now give it a much lower rating if such an attitude were seen to limit the revival of the economy. This is a challenge to those engaged in environmental education programmes to ensure that their proposals are ones that encourage a balanced view of the total environment. Already this has been expressed as one of the general objectives of school geography:

> "To foster a continuing interest in, and encourage an appreciation of, the qualities and needs of the environment seen always in relation to people's social and economic needs."

The objectives of environmental education are an essential part of everyone's education because decisions made now on every scale from local to global will determine the shape of things in the 21st century. Environmental education is a future-oriented study of concern to us all.

Select references

Chapman-Taylor, Ray. *Education and national parks.* Wellington, Department of Lands and Survey for the National Parks Authority, 1976.

Environmental policy and management in New Zealand: a background statement on selected issues prepared as a working document for the OECD Country Review, 1980. (Prepared by the Commission for the Environment). 1980.

Morrison, Peter. *The New Zealand conservation handbook.* Auckland, Heinemann Educational for the National Conservation Week Committee, 1974.

New Zealand. Department of Education. *G2: Practical studies, including field work, in Form Seven Geography: Teacher resource material.* Wellington, Department of Education, 1979.

———. ———. *Learning activities using audio-visual materials: G4.* Wellington, Department of Education, 1980.

Parsons, John. *This precious land.* Wellington, the Nature Conservation Council, 1977.

Renner, John M. *The environment: A study of primary, intermediate and secondary pupils' environmental perceptions, understanding and interest.* Palmerston North, Palmerston North Teachers College, 1979.

Scott, Graeme. *The New Zealand futures game.* Wellington, the Commission for the Future, 1978.

Town planning and you. Wellington, Information Services, Ministry of Works and Development, 1976. □

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PHILIPPINES

by Lilia M. Diezmos

Introduction

In the Philippines, as in the rest of the world, at least four factors of the social entity have caused great concern in recent years: population, pollution, food and energy. They are separate issues, each to be resolved in its own terms. In the Philippines, the alarming rate of population growth is restrained by population education and family planning programmes; the threat of environmental degradation is abated by pollution regulations; the problem of food supply is tackled by a programme for self-sufficiency, and the energy crisis by a search for indigenous sources of fuel and attempts at energy conservation.

There are implicit connections between these four factors. Attempts to resolve one may clash with another. For instance, stringent regulations for pollution control may mean further depletion of energy resources since pollution abatement methods often require the use of more energy.

Recognition of these four factors in the country's efforts toward economic development produces a complicated network of choices for progress. But it is clear that whatever path a nation may take in solving its problems, the solutions must take into account all issues of concern.

Environmental laws

There has been a continuing trend in the Philippines of aspiration to preserve the environment, resulting in stricter environmental regulations controlling human actions. Foremost among these are the anti-pollution laws and the requirement of environmental-impact assessment of almost all major projects. A list of some selected important legislative measures follows:

1. Republic Act No. 3931 created the National Pollution Control Commission (NPCC). June 1964.
2. Presidential Degree (PD) No. 984 revised RA 3931, reorganizing the Commission. August 1976.
3. PD No. 1396 created the Department (now Ministry) of Human Settlements, amending PD No. 984 by transferring NPCC and several other government agencies to this Ministry.

4. PD No. 1121 created the National Environmental Protection Council (NEPC). April 1977.
5. PD No. 856 is a comprehensive document on environmental protection including pollution, nuisances, garbage disposal, sewage collection and disposal, public swimming and bathing places, industrial hygiene, school sanitation and health services, food protection and water supply standards and procedures.
6. PD No. 600 provides for prevention or control of marine pollution. December 1974.
7. PD No. 602 established the National Operation Center for Oil Pollution in the Philippines Coast Guard Headquarters. December 1974.
8. PD No. 825 provides a penalty for improper disposal of garbage and other forms of pollution. November 1975.
9. PD No. 1181 provides for the prevention, control and abatement of air pollution from motor vehicles. August 1977.
10. PD No. 1151 states the Philippines Environmental Policy. PD No. 1152 set up the Philippines Environmental Code. June 1977.
11. PD No. 1160 vests authority in *barangay* captains to enforce pollution and environmental control laws. June 1977.
12. PD No. 1198 requires all individuals, partnerships or corporations engaged in the exploration, development and exploitation of natural resources or in the construction of infrastructure projects to restore or rehabilitate the areas of operation to their original condition. September 1977.
13. Letter of Instruction (LOI) No. 422 creates an Inter-Agency Committee charged with the formulation, implementation and monitoring of policies and action for environmental protection. June 1976.
14. LOI No. 549 orders the NEPC to create an administrative system for the evaluation of the environmental impact of both government and private projects. June 1977.
15. LOI No. 551 issued on the day after the signing of the Philippine Environment Code, this Letter of Instruction sets the deadline for the installation of Anti-pollution devices in all vehicles–public utility, government and privately owned. It also gives the deadline for installation of anti-pollution devices in all factories that emit odors, create excessive noise or discharge effluents into waterways.
16. LOI 553 creates an Inter-Agency Action Committee for the purpose of enforcing existing laws on environmental protection and the prevention and control of pollution. June 1977.

17. NPCC Memorandum Circular No. 001 sets the emission standards for motor vehicles. July 1977.
18. NPCC Memorandum No. 003 announces to the public that an Anti-Smoke Belching Team has been created in co-operation with the Land Transportation Commission (LTC) and the Constabulary Highway Patrol Group (CHPG). It enjoins the public to be 'anti-smoke belching conscious'. August 1978.

Major environmental issues and problems

In the Philippines, environmental pollution has become a national concern. People have begun to understand its effects on their health and welfare and have started to demand remedies to stop the increasing deterioration of our environment. This concern, received from different segments of the society, indicates that the issue has reached a point which needs the support of every person everywhere.

The following are environmental problems in urban and rural areas—first macro then micro—of the Philippines.

Macro kind, related to nationwide development

Water pollution

Water pollution comes from (a) domestic wastes of the general public which include solid waste and domestic sewage and (b) trade wastes coming from industry. Water pollution until recently was limited mainly to urban areas with a concentration of industrial activity and high population density like the Metropolitan Manila area and other big cities. Now, rural areas where isolated industrial establishments like mines, sugar centrals, oil refineries, pulp and paper mills and distilleries are located are already having problems of water pollution.

Lately, increased agricultural activities, as part of the national food production programme, have been contributing to the pollution of the rivers and other bodies of water due to the increasing use of fertilizers, pesticides, fungicides and other chemicals to improve agricultural production. The chemical industry is thus one principal source of water pollution.

Air pollution

Vehicular, aircraft and industrial emissions are the major sources of air pollution in the country. The increasing use of the air as a waste disposal medium by the three sources is clear from the increasing number of motor vehicles, all types of aircraft, and industrial development.

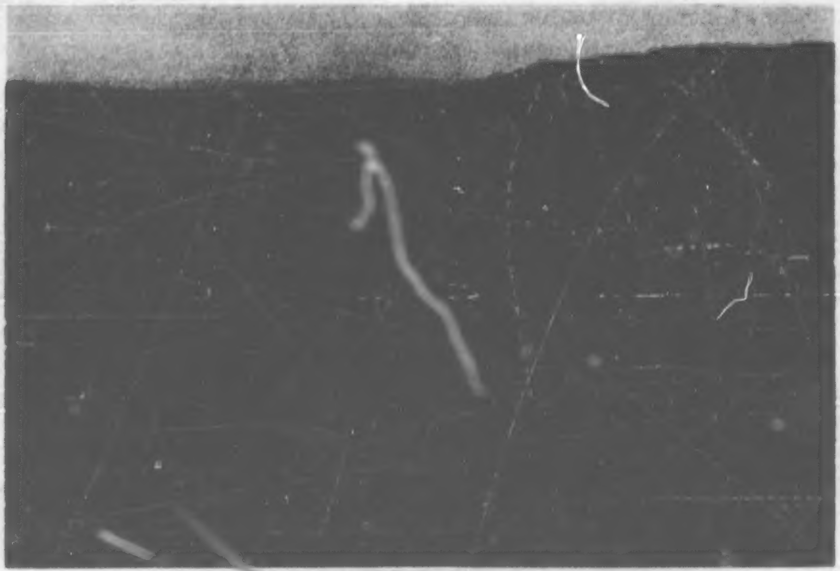
The marked regional disparity in industrial development and urban expansion in favour of Metro Manila has resulted in a particularly heavy concentration of air pollution problems in the area. It is estimated that at least three-fourths of the air pollution load in the area is contributed by vehicular emissions with the rest being contributed by aircraft and industrial emissions.

Land pollution

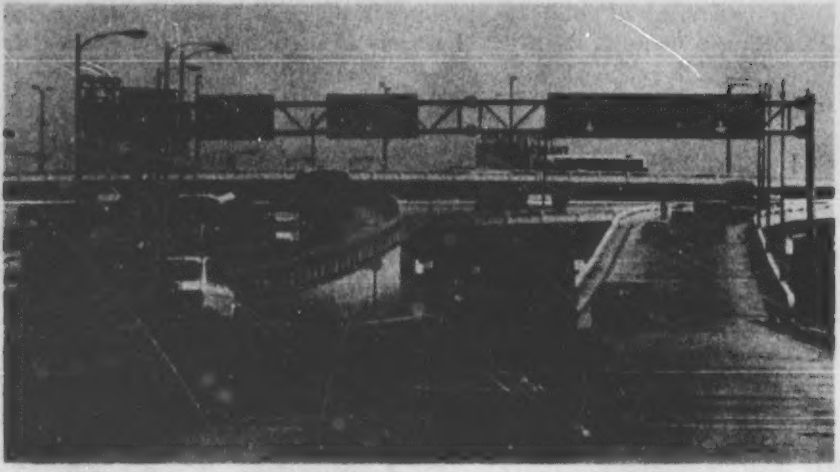
The most serious environmental problem in the country today is the deteriorating quality and availability of soils which is a result of soil erosion and urban encroachment. Soil erosion in the country is very pronounced owing to the rough topography, heavy rainfall, improper land use, farm mismanagement, improper logging, shifting cultivation and road building.

Excessive amounts of insecticides, fungicides, herbicides, fertilizers and other toxic chemicals introduced into the soil can be poisonous and can destroy the soil's ability to self-generate. Other causes are jet and atomic fallout, and mine 'tailings', which poison agricultural lands during floods.

In urban and commercial areas, due to the increase of population, total demand for land space increases. Thus, encroachment on forest and agricultural lands for residential, commercial and industrial sites becomes inevitable.



Former forest and agricultural land is now needed to provide housing settlements for low-income families.



The benefits of modern highway networks tend to be offset by the air and noise pollution, as well as loss of land for farming

Noise pollution

The major urban noise sources are road traffic, construction activities, industries and aircraft. Greater noise problems are expected owing to the future expansion of built-up areas, industry, and air and land transport networks into different areas of the country.

The worst noise conditions are generally encountered in places of work. Exposure to high noise levels for long periods may cause deafness.

Land use

Land use planning in the country occurs at three levels: national, regional and local. The national plan is spread over several years and combines the country's physical planning objectives, policies and strategies for development. The regional plans define the implications of the land use plan for the country's 12 political regions. On the local level, town plans tend to conform to the ecological, historical, cultural, physical, technical and financial resources of the locality, *although many modern housing developments ignore local conditions—to the detriment of the environment.*

At both national and regional levels, land use is grouped by the Ministry of Human Settlements into five broad categories: settlements, forest, agricultural land, mining and quarrying and inland water. There are standards for settlements and forest, but more information is needed before standards can be set for the other three categories.

Most of the country's 1,522 growing settlements are suffering from conflicting land uses resulting from the random, uncontrolled physical growth of communities and from poor perception and understanding of natural processes.

Energy

As we approach the end of the 20th century, we realize that massive and thoughtless use of energy, which has enabled us to live in ease and convenience and to penetrate outer space, may upset the ecological balance and adversely affect the quality of life on this planet.

Of late, there has not been substantial progress in drawing up comprehensive plans for environmental protection from the development, processing and use of energy resources primarily because energy remains in short supply against a steadily growing demand. The result is accelerated efforts to discover and develop new energy sources.

Evidence of a 1976 oil strike in the Philippines

Micro kind, related to everyday living

Environmental health and sanitation

Poor environmental health and sanitation are major factors in the high incidence of communicable diseases. Only about half of the population has access to drinking water, due to inadequate supply facilities. Only two-thirds have a satisfactory means of garbage collection and waste disposal. Garbage dumps and scattered trash are breeding places for flies, rats, insects and other carriers of diseases like cholera, El Tor, typhoid fever, gastro-enteritis, dysentery and diarrhoea.

Communicable diseases constitute the main health problem of the country. Of the ten leading causes of death, five are communicable diseases; namely, pneumonia, tuberculosis, gastro-enteritis, bronchitis and tetanus. More environment-related diseases, with different death rates, occur in the country. Among them are: schistosomiasis, malaria, filariasis, and intestinal capillariasis.

Housing

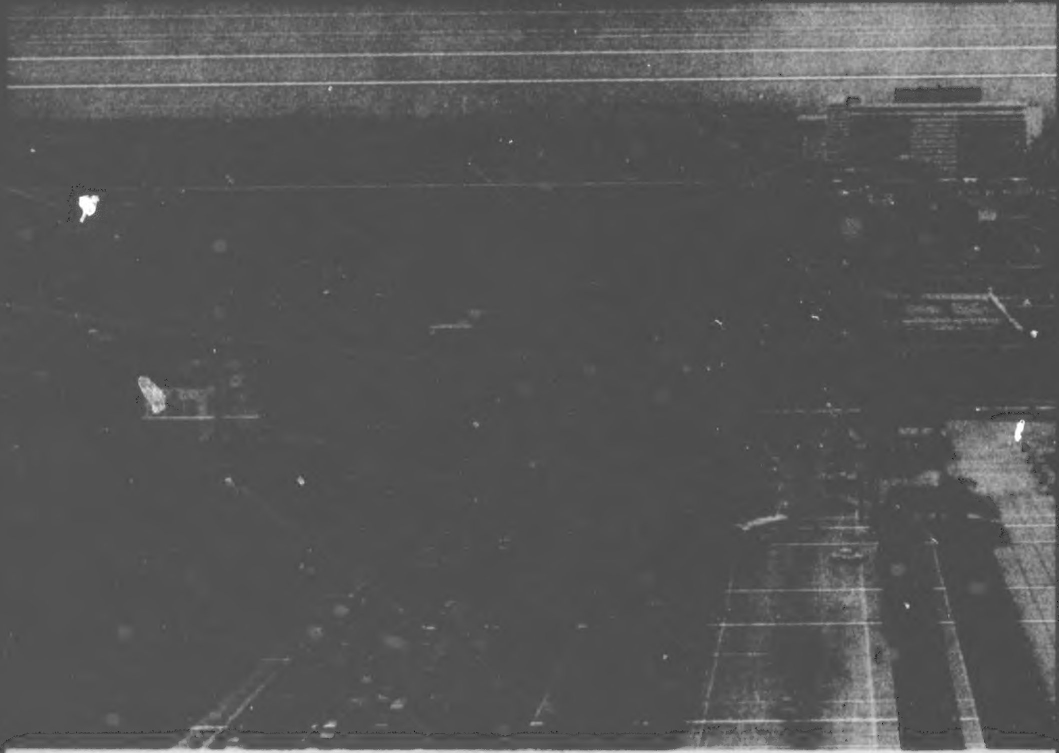
A large proportion of Filipinos live in urban areas, and their housing needs are growing. There are three broad categories of housing in the country: the privately owned, made up largely of typical single homes and the few condominiums; the rented homes such as apartments, dormitories and boarding houses; and the shanties that make up slums which have no legal status yet persist in major urban areas.

Many tend to detach the housing problem from their consideration of the environment, reducing it to an issue of supply and demand. But the environmental quality of housing developments, including open spaces, the surrounding communities, location and population densities, is very much a part of the housing problem.

The country is confronted with chronic housing shortages. In 1978, there was a shortage of more than 1.6 million homes. Current housing programmes are preoccupied with delivering quantity to meet the growing need for shelter, and the need for better housing quality has been neglected.

Major environmental actions

Although the industrialization programme started many years ago, its ill effects have only recently come to official notice. As an immediate step toward the solution of the problem, the National Pollution Control Commission, in co-operation with other agencies, particularly the armed forces, has ordered all violators of stream quality standards in the Manila Metropolitan Area to construct waste-water treatment facilities. Although



Sophisticated development along Manila Bay means economic prosperity—and high energy consumption, traffic jams and air, land and water pollution.

the response is slow, co-operation from industry and voluntary compliance with rules and regulations is appearing. No new firm can be registered with the Board of Investment without securing pollution clearance from the Commission. Under this arrangement, the firm concerned is compelled to install pollution-control devices. Note is also taken of any smoke-belching vehicles for corrective action.

Reduction of pollution from industrial sources, where abatement technology is generally available, is hampered mostly by considerations of cost. Presidential Decree 274 was promulgated to give incentives to install control devices. The incentives include tax exemptions for equipment and devices imported from abroad, and refunds of taxes already paid. The cost of installing control devices may be deducted from the total income of the firms in the preparation of income tax returns. This will encourage industrial firms to make greater investments in pollution control without necessarily affecting their competitiveness.

Another important act intended to control pollution of the Pasig River System in the Metropolitan Manila area, as provided for in Presidential Decree 274, was the formation of the Pasig River Development Council to develop the Pasig River as a tourist attraction.

Other agencies attempting to control pollution, listed with their responsibilities are:

1. Petroleum Institute of the Philippines–prevention and control of oil pollution; the Institute has drawn up a contingency plan for coping with an oil spill,
2. Philippine Coast Guard–enforcement of regulations on pollution of seas and coastal areas,
3. Bureau of Customs–prevention and control of pollution of ports and harbours,
4. Department of Health–investigation of chemical waste and other forms of pollution that affect public health,
5. Bureau of Mines–siltation of river beds due to mine 'tailings' or disposal of other mine wastes,
6. Bureau of Fisheries–pollution of inland waters and marine fishing grounds,
7. Bureau of Public Works–dredging of canals and other waterways in the Metropolitan Area,
8. Construction Development Corporation of the Philippines–reclamation of foreshore areas in Manila Bay, and
9. Laguna Lake Development Authority–overall economic development of the Laguna Bay region.

Routine inspections of factories are conducted by staff engineers of the Commission. Violators of regulations are called to a hearing and, if it is warranted, the offending industries are ordered to stop discharging industrial wastes. A permit system enables the Commission to review plans for pollution-control devices before they are installed so that alterations can be made if necessary.

There is much more to be done to solve environmental pollution problems. The basic method of enforcement by persuasion needs to be improved. Information on the environment must be improved and regularly brought up to date. There must also be a complete and continuing industrial and municipal wastes inventory. Present water and air quality monitoring systems are hampered by a shortage of staff and money, and so not enough is known about the amounts and types of pollutants discharged into the environment.

A Workshop on Education and Training Needs for Philippine Environmental Programmes, conducted under the joint sponsorship of the National Science Development Board and the National Academy of Sciences of the United States in Manila in May 1974, recommended the teaching of environmental education from primary school through university, and in both public and private schools. It was high time that this subject be included in the educational system so that correct information could be disseminated to the community through the schools, making the people aware of environmental issues.

Environmental education is a continuing process in academic institutions and in-service training programmes of agencies with planning responsibilities. The Ministry of Education and Culture, through the School Health and Nutrition Center, adopted an Environmental Education Programme. The concepts, problems and issues of environmental education are included in the primary and secondary school and university curricula. Training programmes in planning agencies also offer opportunities for furthering environmental education, for example in workshops attended by planners, scientists and resource managers from a variety of organizations who may develop ecological approaches to project planning.

Although there are still few attempts to rationalize resource management and planning, there are efforts by some government agencies to involve outside organizations in tackling important problems. One result of this is the creation of and support for the Philippine Social Science Council.

Curriculum development in environmental education

Definition, scope and role. Environmental education is a process of developing a citizenry that is knowledgeable about the natural world and man-made environments and about the ecological relationships between human beings and their environment; a citizenry that is skilled in inquiry,

Construction of a giant flood drainage system in Manila investigative techniques, critical thinking and decision-making, that is aware of environmental problems and is concerned about the protection and preservation of the environment.

Environmental education aims to develop in people a recognition of their responsibility to maintain the environment so that it is fit to live in, to preserve an environment of beauty and bounty in which man lives in harmony. It seeks to develop in the learner a healthy respect for and a stable relationship with his environment.

Enormous technological changes, the world's rapid growth in population, and scientific and industrial progress have resulted in an environmental crisis which poses a threat to the survival of the human race. Human beings, themselves waste-producing organisms, should know how to dispose of their waste in order to maintain healthful surroundings conducive to healthy living.

Objectives of environmental education

General objectives:

1. To educate the people in the prevention of pollution as a means of improving environmental quality, and
2. To adopt practical measures in order to combat diseases and prevent deaths caused by pollution.

Specific objectives:

1. To train a staff of teachers in environmental education,
2. To adopt practical strategies to control and prevent pollution of air, water and soil, and
3. To create a system for educating students and the community.

Concepts for environmental education. There are many approaches to developing concepts for the environmental education objectives. With science education as a core, it may be correlated with other educational schemes such as value education, agricultural and rural education, community education and conservation education. We should also consider a multidisciplinary approach if we are to promote the "total education" of the individual who shall be motivated to protect and improve the environment for his own well-being.

The scope and sequence of the conceptual scheme for environmental education is based on the ecological theme: *The earth has finite resources and all life depends on how successfully human beings can learn to harmonize their use of the earth's resources with natural communities and ecosystems.*

Five major concepts contribute to the development of the conceptual scheme. Each statement under a major concept is presented in a learning sequence—and the order of the sequence will be in the form of a 'spiral development', in which at each level of sophistication, the students proceed from the most basic concepts through the entire sequence as far as their maturity and learning capacity will permit them to go toward understanding the fundamental concepts.

In primary school, the emphasis is on developing understanding which will contribute to the children's behaviour as trustees of the natural resources and as future decision-makers and participants in the development of the country. In secondary school, these teachings will be considered but there will be more stress on problem-solving activities.

A conceptual scheme for environmental education might include the five major themes listed below.

A. Living things are interdependent with one another and with their environment.
B. Organisms (or populations of organisms) are the product of their heredity and environment.
C. Organisms and environments are in constant change.
D. When matter changes from one form to another the amount of matter remains unchanged.
E. The economy of a region depends on the utilization of its resources and technology.

A tractor replaces the buffalo in the background, but uses a costly resource—oil.

With these concepts as tools, teachers may guide their students to discover what is in their surroundings, to place their discoveries in a perspective that will encourage awareness and imaginative problem-solving and develop an understanding of their relationships with the environment. Learning sequences are given below by grade: the language would be simplified where necessary for the lower grades.

A. Living things are interdependent with one another and with their environment

Grade I learning sequence

1. Around the school are many different kinds of plants and animals.
2. Plants provide clothing, shelter and recreation.
3. Animals are important to man because they help to serve many of our needs.
4. Plants remove essential elements from the soil.
5. Living things require water.
6. Plants, animals, soil and water are related to one another.

Grade II learning sequence

1. Food is stored in leaves, stems, roots and seed in plants.
2. Plants are the source of all food: animals use, convert and store this food.
3. Animals need food, water, cover and space.
4. Plants and animals live together and depend on each other for some of their needs.
5. Water is made available to living things by a cycle of evaporation and condensation.
6. Most living things depend on oxygen in the air.

Grade III learning sequence

1. Energy sources involved in weather include the sun and the rotating earth.
2. Green plants get matter from the environment for growth.
3. Plants provide the soil with cover and protection.
4. Trees help in keeping water where we need it.
5. All living things finally depend on green plants for food.
6. Humans need the wilderness and natural areas for play as well as for their practical value.

Grade IV learning sequence

1. Plants and animals are dependent on each other and their non-living environment.
2. The interactions of most organisms and their environment are reciprocal.
3. Natural predation is necessary in order to maintain a healthy population or certain species in balance with the environment.
4. Temperature, rainfall and other weather elements are important factors which should help us determine our use of the land.
5. Inorganic soil is formed by weathering of rocks, due to action of water, wind, heat and cold.

Grade V learning sequence

1. A balance of nature is kept through the interrelationship of plants and animals and their non-living environment.
2. Organisms may suffer and die when an imbalance in nature occurs.
3. Increasing populations require an increase in food production to prevent ecological decline.
4. Trees influence soil, water, wildlife and the landscape.
5. Individual interaction with the environment creates appreciation for the environment.
6. The living world maintains balance through cycles.

Grade VI learning sequence

1. Man's use of streams, lakes and the sea provides him with many of his personal and community needs.
2. Forests have many natural enemies (disease, wild animals, domestic animals, man, fire and weather).
3. Plants growing together form communities. Each member of the community influences its neighbour.
4. Life within a group imposes duties and responsibilities as well as entailing rights and privileges.
5. Responsibility for maintaining an environment for life and fulfilment of needs and interests is the result of interaction between national and local units of government.
6. Living things interchange matter and energy with the environment.

Lower secondary stage learning sequence

1. Green plants capture energy from the sun and combine it with raw materials from soils, water and air.
2. Plants store food in the forms of starch, sugars, proteins, vitamins and cellulose.
3. In one of nature's important cycles, nitrogen from the air is made available to plants and animals.
4. In the carbon dioxide cycle, oxygen is freed and returned to the atmosphere.
5. Plants keep the supply of oxygen in the air constant through photo-synthesis.
6. In a biotic community, species tend to interact with one another and modify the conditions of life with which each exists.
7. Species and environmental factors interact to keep animal population in balance in the community.

B. Organisms (or population of organisms) are the product of their heredity and environment

Grade I learning sequence

1. Each kind of plant and animal has certain needs. It can live only in places where these needs are met.
2. Animals have a habit of living in a kind of place where they are able to satisfy their needs.

3. Plant growth depends in part on the amount of radiant energy received from the sun.
4. Each kind of tree has its shape, bark, wood, leaves, flowers and fruits different from others.
5. Animals and plants fit the place where they live.

Grade II learning sequence

1. Living things are linked by their food habits.
2. Green plants differ from other living things in that they make food for the living world.
3. Plants respond to light, gravity and water.
4. Plants are adapted to a wide range of environmental factors.
5. Special surroundings make things behave to suit these surroundings.

Grade III learning sequence

1. Different types of animals vary in their organic needs.
2. Living things are organized in form and function to carry on activities that sustain life.
3. The sun's elements are all found in the earth.
4. Space on earth is limited. All living things occupy space.
5. Competition is the foremost of all relationships between living things.

Grade IV learning sequence

1. Animals compete for space, food and shelter.
2. Environment determines the kinds of organisms which live in the community.
3. Living things reproduce and develop themselves in a given environment.
4. Energy from the sun is stored in many forms.
5. The sun is the major source of energy involved in the weather.

Grade V learning sequence

1. A living thing reproduces itself, develops and interacts in a given environment.
2. Living things capture matter from the environment and return it to the environment.
3. A natural habitat has limited capacity for supporting the organisms that live in it.
4. Wildlife must be conserved and controlled to prevent extinction or overpopulation.
5. Continued population expansion in a limited space creates problems with food, clothing, shelter and recreation.

Grade VI learning sequence

1. A sense of beauty is essential to the well-being of man.
2. Many adaptations to changes in the environment are necessary from one generation to another.
3. Man is the only organism that can consciously modify its own environment.
4. The participation of citizens in a community ensures the creation of a society in which all individuals can develop fruitfully.

5. Man can alter the environment of organisms in order to destroy or protect them.

Lower secondary stage learning sequence

1. The characteristics of a living thing are laid down in a genetic code.
2. Living things reproduce and develop themselves in a given environment.
3. Special environments require special adaptive behaviours.
4. All organisms have limits of tolerance for environmental variations.
5. Group living requires co-operation within and between groups in order to maintain the best physical, social and cultural environment.

C. Organisms and environments are in constant change

Grade I learning sequence

1. The air we breathe is the same on the entire surface of the earth.
2. Air contains water. Air receives water through evaporation.
3. Air supports combustion.

Grade II learning sequence

1. Nature and man shape the earth's surface.
2. The weather causes constant changes on the earth.
3. The water of the earth is in constant change.
4. Soil holds water.

Grade III learning sequence

1. Chemical and physical changes in the earth's crust change rocks into soil.
2. Soil erosion by water, wind, and gravity are examples of the constant change occurring on the earth's crust.
3. Mountains are formed by folding and faulting in the earth's crust, by volcanic action and by erosion of plateaux.

Grade IV learning sequence

1. Some rocks and minerals have a plant or animal source.
2. Minerals are classified according to origin and physical properties.
3. Air exerts pressure in all directions. Air pressure can do useful work.
4. Air contains dust and other pollution.
5. The topsoil on which life depends is a thin layer of the surface of the earth.
6. A lack of balance in non-living things exists because of the changes of the earth.

Grade V learning sequence

1. Changing environments affect living things.
2. Living things have changed over the ages.
3. The oceans are a source of minerals.
4. Some mining operations threaten other resources and are threatened by depletion.

Grade VI learning sequence

1. Soils are a combination of minerals, living organisms, organic matter, water and air.
2. Water is a self-replenishing and self-depleting resource; it is intermittently replenished by precipitation and is steadily depleted by evaporation, percolation and surface- and underground-runoff.
3. Forests are constantly undergoing change, and as they mature, and are harvested or die, some species of plants and animals may be replaced by others.
4. Wildlife population are decreased by many natural and man-made factors.
5. The erosion and misuse of productive topsoil helped to cause the disappearance of some nations. A shift in fertility of surface soil can cause a shift in human population.

Lower secondary stage learning sequence

1. The planet earth has many examples of geologic changes
2. Fossils are evidence of former plant or animal life.
3. Living things have changed through the ages.
4. Changing environments affect living things.
5. Man influences living things by changing the environment to meet his needs.

D. When matter changes from one form to another the total amount remains unchanged

Grade I learning sequence

1. Water dissolves many substances.
2. Water expands when frozen. Warm water rises.
3. Wind is moving air.

Grade II learning sequence

1. Water evaporates to become a gas (water vapour) and freezes to become a solid (ice or snow).
2. Physical changes in matter can be both helpful and unhelpful.

Grade III learning sequence

1. Properties of a substance affect its reaction with other substances.
2. Through the process of decay or decomposition, organic matter is broken down to form soil humus.
3. In chemical or physical change, the total amount remains constant.
4. The sun's energy striking a surface is absorbed, reflected and/or transmitted.

Grade IV learning sequence

1. Weather forecasting is based on the knowledge of the weather elements.
2. Chemical changes in matter produce useful products.
3. Matter exists in small units called molecules and atoms.
4. Atoms have weight.

Grade V learning sequence

1. The constant composition of the atmosphere can be upset by the activities of man.
2. Chemical changes in matter can be destructive or constructive.
3. Knowledge of the concepts underlying combustion enables us to prevent losses by fire.

Grade VI learning sequence

1. Living micro-organisms, fungi and small animals help to decompose the organic matter in the soil.
2. Living things depend upon bacteria in the soil to convert inorganic matter into usable nitrates.
3. Weather managemont is carried out by smudge pots, trees used as windbreaks and cloud seeding.

Lower secondary stage learning sequence

1. Matter can be transformed to produce energy.
2. Some minerals are valuable forms of matter which can be converted to usable products of energy.
3. Production of electrical energy is dependent upon natural resources.
4. The use of electricity, synthetic materials and nuclear energy may not reduce the pressure of depletion of scarce resources.

E. The economy of a region depends on the utilization of its resources and technology

Grade IV learning sequence

1. Trees and products from trees are vital to the economy of the community, city, nation and the world.
2. Fertile soil was partly responsible for the patterns of development and the speed of advancement of technology.
3. Careful land management practices help to reduce the flood waters and silt that small streams empty into rivers and lakes.
4. Forests are important in helping to protect watersheds from droughts and floods.
5. One phase of wildlife management is the proper control and manipulation of habitats by man through (a) fire, cutting, and spraying, (b) flooding, (c) food and cover planting, (d) lakes and stream improvement and (e) soil conservation practices.

Grade V learning sequence

1. Man uses the resources of the environment.
2. Wise use of community resources tends to assure their availability.
3. A nation's physical foundation is its soil resource, and the nation's success depends much on how well this soil resource is managed.
4. The oceans provide high-quality protein for the diet of man, and minerals for his industries.

5. Planting, experimentation, and selective and clear cutting, followed by replanting and fire control are part of the work of managing forests.
6. Carelessness that often results in the destruction of natural resources includes soil erosion, fire, drainage and pollution of water.

Grade VI learning sequence

1. There are two types of resources—renewable and non-renewable.
2. We hold title to and can as stewards or trustees freely use our natural resources.
3. The nature and abundance of a community's resources change during a lifetime.
4. Various kinds of industries will need to depend on the scientific method and scientific practices to solve their problems as polluters of the environment.
5. People cause pollution and destruction of natural resources, and people as citizens have a responsibility to conserve resources and prevent environmental degradation.

Lower secondary stage learning sequence

1. Man has learned to conserve and improve soil by using fertilizer and lime, and by erosion control, irrigation, and other conservation practices.
2. Forest-management practices will sustain catchment areas and prevent wasteful lumbering and soil erosion.
3. A continuing and adequate supply of fresh water depends on the wise use and development of water resources.
4. Industrial pollutants can be disposed of with minimum damage to the environment.
5. Recycling of wastes can diminish pollution and depletion of resources.
6. Deep concern on everyone's part can lead to the enhancement of the environment.
7. Growing population and increased demands for agricultural and industrial products may cause pollution problems and the depletion of resources.

Strategies for introducing environmental education

In primary grades, environmental education concepts are integrated into existing subject areas. In lower secondary, the first science course is now Environmental Science. In order to be effective it must be related to life situations and to the other subjects of the curriculum as well. This will enable students to learn other subjects well and to relate environment to such subjects, particularly advanced Science and Social Studies.

Preparation of curriculum and instructional materials. Various curriculum development activities were initiated to enhance pupil achievement; the major undertakings were the development of the Elementary Learning Continuum (ELC) and the Experimental Elementary Education Program.

The ELC defines basic learning elements for all children and indicates how these should be sequenced for mastery. Key Behavioural Indicators

(KBIs) have been identified and are reflected in the revised ELC. These KBIs are development-oriented and contain values intended to remedy certain weaknesses in Filipino learners identified by researchers. The ELC has been fielded for tryout and the 1980 output consisted of a revised version on the basis of analysis of feedback data. UNICEF has assisted with its printing.

The Experimental Elementary Education Programme started in the school-year 1978-1979 and has now completed its tryout. It was designed to satisfy the need for a curriculum which would produce good outcomes in the basic skills. When finally approved, the Programme will offer fewer subjects in the first two grades to allow mastery of basic skills. In effect, Science and Health subjects provide most of the content in learning English while Social Studies and Character Education provide most of the content in Pilipino in grades I to III. It also provides a common work-education curriculum for boys and girls which emphasizes the learning of values.

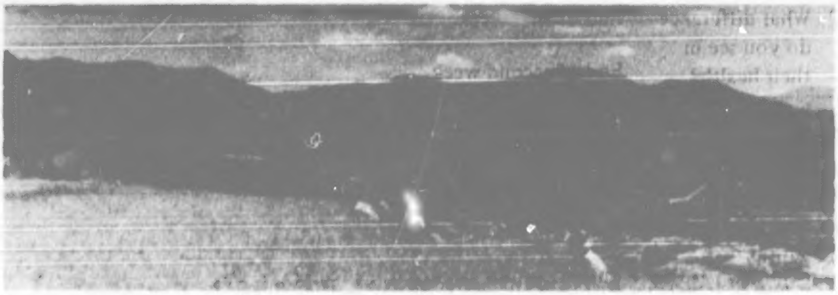
In addition to the ELC and EEEP, the following are Pupils' references:

- *Soil conservation* for K-grade VI
- *Credit consciousness* for K-grade VI
- *Dangerous drug prevention education* for K-grade VI
- *Agrarian reform* for K-grade VI

Teachers have references on the same four topics, as well as the following:

- Southeast Asian Science and Mathematics Experiment (SEASAME) *Manual for teachers*
- *Instructional package of literature, music and dances and handbook for a self-teaching kit.*

In addition there are pamphlets, radio and television materials, modules, a 'do-it-yourself' the kit, audio-visual materials and evaluative instruments.



Learners' activities

Examples of experiments. On the pages which follow are three outlines of experiments undertaken in the elementary and secondary grades.

GRADE I

Area : ANIMAL LIFE Unit : THE EARTHWORM: ITS HABITAT

Part I. THE EXPERIMENT

1. *We want to know:*
   - a) Where do earthworms live?
   - b) In what kind of soil do earthworms grow best? Why?
   - c) What do they do with the soil in which they live?
2. *We use:*
   - a) Four open wooden boxes, 15 cm wide, 30 cm long, and 15 cm high
     - Box A–containing clay soil
     - Box B–containing moist soil with decaying leaves, grasses and twigs
     - Box C–containing stony soil
     - Box D–containing sandy soil.
   - b) Twenty earthworms of the same size and species.
3. *We do:*

   Fill the four wooden boxes with different kinds of soil as mentioned above. The boxes should not have holes. Put five earthworms into each of the four boxes. Cover them with netted bamboo strips to prevent the earthworms from coming out of the box and at the same time allowing air to go into the boxes.

   Divide the pupils into four groups, each group to observe the box assigned to it and to make a record of observations using the following or similar table.

Conditions observed		Box A	Box B	Box C	Box D	Remarks
1. Number of healthy earthworms	End of first week					
	End of second week					
2. What difference do you see in their health?	End of first week					
	End of second week					
3. Number of casts in each box	End of first week					
	End of second week					
4. New earthworms	End of first week					
	End of second week					

4. *We observe:*
   a) In which box are the earthworms healthiest?
   b) In which box are there the most casts and new earthworms?
5. *We learn:*
   a) How does moist,wormed soil with decaying leaves and grasses help earth? Why?
   b) What purpose do decaying leaves and grasses serve?
   c) Do you think earthworms are beneficial to people? In what way?
6. *We propose to do:*
   a) Have an extension of the experiment by having a field trip to a canal, to a farm, or to a creek. Where do earthworms abound?
   b) Why do earthworms live in these places?
7. *We hope to make:*
   a) Are there places in the school yard and in your own yards which could be developed into wormeries? How can such wormeries be made?
   b) How would you like to make such wormeries in the school yard and in your home lots? (Arrange to have wormeries made in the school yard and in the children's yard).
8. *References:*
   Encyclopedia Britannica Jr., p. 214

IMPLICATIONS FOR OTHER SUBJECT AREAS

1. *Good manners and right conduct:*
   a) In what ways can we show kindness for and appreciation of earthworms? Should we allow the worms to die?
   b) Should children play in places where earthworms are found? How?
2. *Arithmetic:*
   a) Count the number of earthworms in the different boxes.
   b) Add the number of new earthworms to the number of old earthworms in each box. In all the boxes.
   c) Add the number of healthy earthworms Add the number of earthworms that are sick. Subtract the number of sick earthworms from the total number of earthworms.
   d) Measure the length, width, and height of the boxes, the length of the earthworms.
   e) How many casts of soil are found in each box?
   f) Have pupils count the number of wormcasts found in their home lots.
3. *Language arts:*
   a) Tell short stories about earthworms. Ask those who have had experiences with earthworms to tell the class about them.
   b) Read the observations made on the different boxes.
   c) Call attention to the spelling of the words used in the experiment.

4. *Social studies:*
   a) Lessons on the needs of earthworms. Why do they thrive in certain soil?
   b) Why are earthworms important to farmers? To fishermen?
   c) Health: How can we save the unhealthy ones?
5. *Music:*
   a) Sing songs of appreciation for the earthworms. Are they ready-made songs?
6. *Work education*
   a) Prepare the boxes for the different soil. Weave bamboo strips to cover them.
   b) Collect different kinds of soil.
   c) Develop wormeries in school and home yards and transfer earthworms to farms and yards where they can multiply and build worm casts.
   d) Prove the value of worm casts to plants in the school and pupils' homes.

GRADE III

Area : FOODS [Unit : UTILIZATION OF GARBAGE]

Part I. THE EXPERIMENT

1. *We want to know:*
   Does garbage have value?
2. *We use:*
   Banana and papaya peelings, eggshells, shrimp shells, heads and bones of dried fish, *camote* (sweet potato) leaves, *darak* (rice husks), chickens.
3. *We do:*
   Buy two live chickens (chicken A and chicken B) of the same size and weight. Get banana and papaya peelings, eggshells, shrimp shells, heads and bones of fish, *camote* leaves, *darak*.

   The pupils are divided into groups.

   Group I grinds the heads and bones of the dried fish. Group II chops the peelings and *camote* leaves. Group III chops eggshells and shrimp shells. Group IV mixes *darak* with a small amount of water.

   Next, groups I, II and III mix all the refuse together. They feed chicken A with the mixed refuse. Group IV feeds chicken B with *darak* only.
4. *We observe:*
   a) Does chicken A like to eat the mixed refuse?
   b) Compare the weights of chicken A and chicken B every week for one month. Record your observations in the following table:

Chickens	One week	Two weeks	Three weeks	Four weeks
A				
B				

5. *We learn:*
   a) Do chickens like to eat mixed refuse?
   b) Is mixed refuse better chicken food than *darak*?
6. *We propose to do:*
   a) In school: We encourage our friends to place fruit peelings and food scraps and waste in a receptacle and gather these for chicken food.
   b) In the community: We promote the use of fruit and vegetable peelings, eggshells and other refuse for poultry food.
7. *We hope to accomplish*
   Help people to appreciate the value of food refuse and to use it for poultry food. This should reduce dirty and foul-smelling surroundings.

Part II. IMPLICATIONS FOR OTHER SUBJECT AREAS

1. *Language arts:*
   Teach such expressions as banana peelings, chop, grind, garbage, feed, refuse, *camote, darak*, mix together. Write a short paragraph on how garbage can be of value. Read the paragraph and invite discussion.
2. *Arithmetic:*
   Weigh the chickens using kilos or pounds. Compute how much money was saved when chickens were fed with the mixed refuse.
3. *Social studies:*
   How does using waste help the community?

HIGH SCHOOL

Unit II–HOW MAN CONTROLS LIQUIDS AND GASES

Topic A–Pressure of liquids:
Experiment 2–Downward pressure of water

Phase I

a) *We want to know:*
To analyse and compare downward pressures of water of different depths. Which has a greater downward pressure, deeper water or shallower water?

Phase II

a) *We use:*
Two-foot-high can, water, two-foot-high supporting stand, corks, metre stick.

Phase III

a) *We do:*
Bore five holes at the side of the can, which should be bored four inches (10 cm) apart from each other from the upper part of the can going downward. Place the can on the supporting stand. Close the holes with corks. Fill the can with water. Then start removing the corks from the holes starting from the highest hole to the lowest. Measure the distances of the places where the water falls from the foot of the supporting stand.

b) *We observe:*

Which of the five holes pours water farther from the foot of the supporting stand?

Which of the five holes pours water nearer to the foot of the supporting stand?

What are the downward pressures of water at the different depths as indicated by the distances of the holes from the upper part of the can or from the bottom?

Downward pressures of water

a) at 4 inches	(10 cm)	from	the	bottom	lbs/inch or gm/cm?
b) at 8 "	(20 cm)	"	"	"	" " " " " ?
c) at 12 "	(30 cm)	"	"	"	" " " " " ?
d) at 16 "	(40 cm)	"	"	"	" " " " " ?
e) at 20 "	(50 cm)	"	"	"	" " " " " ?

c) *We learn:*

Data	Inferences
1. Why does the water from the holes fall on different places at different distances?	1.
2. Why does the water coming from the lowest hole fall farther from the foot of the stand?	2.
3. Why does the water coming from the highest hole fall nearer to the foot of the stand?	3.
4. What can we therefore conclude?	

Phase IV

a) *We apply:*

How do we make use of water pressure in our homes?

How do the Water Authority construct water main pipes and secondary pipes to the homes?

How much water do the homes, far from the water source of the reservoir, get?

How much water do the nearer homes get?

How can the principles of water pressure be applied to irrigation of lands?

Phase V

a) *Moral and ethical implication*

What problems confront farmers in using an irrigation system?

Why do two families living in a two-storey building compete regarding the use of water faucets?

Do the homes receive an equal amount and pressure of water from the central system?

How must the water main and secondary pipes be constructed so that the consumers will not quarrel?

Do the lands of the farmers getting water from the irrigation systems receive equal amounts and pressure of water?

Expenditure

Indicating the government's strong commitment to environmental protection is government expenditure for environmentally related programmes. In 1978, it amounted to 882,000,000 pesos (₱) distributed to the agencies whose primary functions are related to natural resource management, pollution control and environmental planning.* For every ₱ 100 spent for environmental protection in 1978, approximately ₱ 93 went to natural resource management, ₱ 6 to environmental planning and ₱ 1 to pollution control. Expenditures since 1980 will probably amount to more than one thousand million pesos yearly.

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* Approximately 7.65 pesos (₱) = one US dollar.

A look at the future

Proper environmental education in our schools can bring environmental problems to the awareness of our people. An awareness of these needs will in the years ahead give new dimensions to the trends in the education system by focusing on the study of the environment as related to social problems. Environmental education should be oriented towards the question of the human value rather than the material value.

Discussions are in fact under way at policy-making level in the Ministry of Education to bring in Environmental Living as a major subject area of the elementary education curriculum. The subject might be divided into components such as the following:

- Living in a Socio-Economic Environment (incorporating aspects of sociology, history, geography, economics)
- Living in a Cultural Environment (incorporating aspects of Music, Art, PE)
- Living in a Physical and Biological Environment (incorporating aspects of Science, Health)
- Living in a Work Environment (incorporating aspects of work and livelihood).

Environmental education should be not just conservation education concentrating only on the study of ecology and pollution. It must also stress environmental concepts in the context of the social and behavioural sciences.

Select references

Philippine environment 1978. National Environmental Protection Council. An Information Handbook. Manila, 1978.

Primer on pollution, Alamin ang Kapaligiran Special Project, 1979. Ministry of Public Information. An Information Handbook. Manila, 1979.

Annual report 1978. National Pollution Control Commission

Primer on Philippine environmental decrees. National Environmental Protection Council.

Annual report of the Director, Bureau of Elementary Education 1979. Manila, December 1979. ☐

*Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
Number 22, June 1981*

REPUBLIC OF KOREA

by Chung Kyu Charn

Introduction

The Republic of Korea has a population of about 35,000,000 and, in 1978, had an annual rate of population growth of 1.8 per cent.

Due to rapid industrialization since 1970, the country is now faced with grave problems arising from pollution of the environment. The history of environmental education is short in the Republic of Korea but everyone is aware of its importance.

Environmental problems and issues

National mandates. An Environment Preservation Law was introduced in 1977, for the purpose of preventing hazards to public health and sanitation due to pollution of the air, water and soil, and for the purpose of preserving the environment properly, thereby contributing to the improvement of national health.

In order to preserve the environment and combat the problems of pollution, the Office of the Environment, a government organization, was established in 1978. It has three bureaux: for Planning and Adjustment, for Preserving Water and for Preserving the Atmosphere. This office deals with the nation-wide problems of water and air pollution and preservation of the natural environment.

A Charter for the Preservation of Nature was adopted in October 1978. The text, in translation, of this charter appears on pages 166 and 167.

The *Saemaul Undong* (New Community Movement), which is a nation-wide campaign for improving living conditions and standards in both rural and urban areas, includes efforts for the preservation of the environment.

Nation-wide campaigns for the preservation of nature are being undertaken both by the Government and by various civil organizations, such as:

1. National Council for Nature Preservation,
2. National Association for Protection of Wild Animals, and
3. Korean Alpinists Associations.

CHARTER FOR THE PRESERVATION OF NATURE

Man is born a part of nature, lives on its provisions, and eventually returns there. All things in the sky, the earth and the seas have been provided as resources for our life.

Nature, which is the source of life for human beings and other living creatures, is continuously transformed while always maintaining order and harmony in accordance with the profound laws of the universe.

From time immemorial our forefathers have endeavoured to make theirs a beautiful land and to create a distinct national culture in harmony with nature.

Now, the air and water have become polluted in consequence of the development of industrial civilization and the expansion of the population. What were once green fields have become barren. Man's indiscriminate plundering is destroying the balance of nature. The living environment has deteriorated, threatening the survival of man and all other living creatures.

It is imperative, therefore, that all people renew their appreciation of nature, take loving care of it, eliminate sources of pollution, and endeavour to restore and maintain the order and harmony therein.

We hereby establish the Charter for the Preservation of Nature, supported by the aspiration of the entire nation, and pledge to faithfully practise it, in order to bequeath to our posterity a more beautiful and useful land.

1. It is the duty not only of the government and public organizations, but also of each individual member of this society to preserve and take good care of nature and the natural environment.

2. Scenic beauty and natural resources with cultural and scientific value should be protected in the interest of all humanity.

3. The preservation of nature should become part of daily life through education at home, in the school and in society.

4. Development should be carefully pursued in harmony with nature, and the preservation of nature should take precedence over development.

5. The pollution and destruction of nature through the disposal of garbage and waste and the excessive use of chemicals should be prevented.

6. The natural environment which has been damaged and destroyed should be immediately restored.

7. Nature preservation should start by each individual cleaning his immediate surroundings, and proceeding to make the entire land green and beautiful.

Oyster farming on the southern coast

Major environmental problems. The environment in the Republic of Korea suffers from a large number of sources of contamination, mainly as a result of the rapid progress of industrialization. Some of the problems are as follows:

Problems related to national development

1. Culture beds along the seashore are damaged by industrial sewage,
2. Crops and farmlands are damaged or contaminated by the use of chemical insecticides and fertilizers containing such heavy metals as mercury or cadmium, and
3. Waste from mines and sewage from cities contaminate rivers and reservoirs, killing fish and other aquatic life.

Problems related to everyday living

1. Inhabitants near industrial complexes are occasionally reported to get skin and respiratory diseases,
2. People have been poisoned by seafood contaminated by industrial sewage,
3. Factory workers have been poisoned by heavy metals such as mercury,
4. Due to imperfect disposal of sewage from cities, problems have arisen concerning the pollution of the drinking water supply, and

5. As the amount of fossil fuel used for industry increases, air pollution by sulphur dioxide, hydrocarbons and nitrogen oxides has taken place and is becoming a threat to national health.

Problems related to global ecology

1. Pollution of the sea by oil discharged from ships has been reported,
2. Radioactive substances have been reported to have leaked from atomic power plants, and
3. Considerable amounts of sulphur dioxide, nitrogen dioxide and hydrocarbon compounds are released into the atmosphere by oil combustion and may affect the global ecology.

Major environmental actions

Government action

As we have seen, the Environment Preservation Law was introduced in 1977, the Office of Environment was established in 1978, and the Charter for the Preservation of Nature was introduced in 1978.

Civilian action

1. Warnings or reports of damage by pollution are given by the mass media.
2. Various civilian organizations mentioned above are engaged in efforts to preserve the environment. These organizations are supported partly by the Government.

One of the most important joint efforts is a project called the Nature Preservation Movement. It started in 1979 as a national campaign to show the public the vital importance of environment preservation and to encourage action to protect the natural environment from hazards and pollution. It was formed by the joint efforts of the government and civilian organizations concerned.

The project's objectives are to:

1. Carry out activities for preserving the environment,
2. Cleanse the natural environment,
3. Offer education and guidance in environmental preservation,
4. Establish and manage facilities for environmental preservation, and
5. Find and report damage to the environment.

People throughout the country are asked to participate, especially in the civil services, and all schools are requested to join the project, which undertakes the following activities:

1. Restoring the natural environment where it has been damaged,
2. Protection and repairing of natural and historical resources of cultural value,
3. Cleansing neighbourhoods, rivers, mountains, and
4. Education in environmental preservation.

The project's special feature is that it will be continued for many years and is being carried out by the joint efforts of the government and the people, all of whom are urged to participate.

Environmental education

There is one undergraduate course in nature conservation, and there are two graduate schools for environmental studies. These educational institutions aim to educate specialists and teachers in environmental preservation.

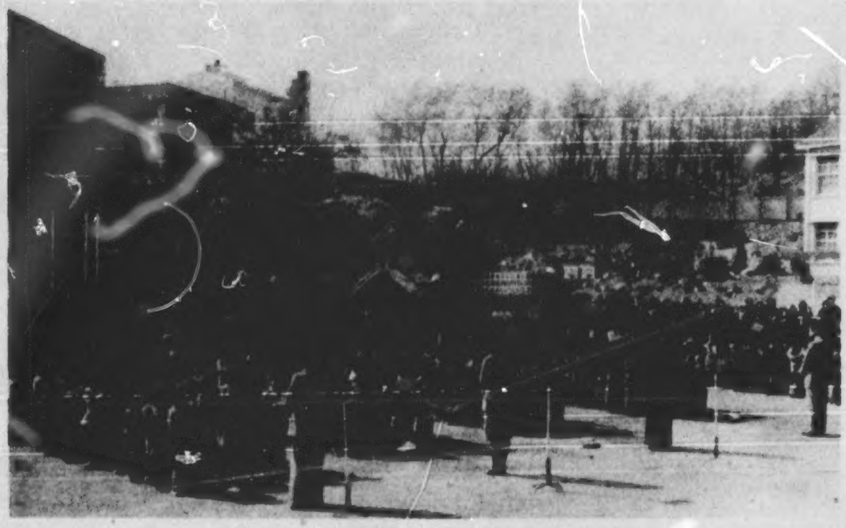
Curriculum development in environmental education

We are living in an age when our hopes for a happy and satisfying life are frustrated by the destruction of the natural environment caused by the pollution of water and air, and by the wastes produced by industrialization. In addition, we are faced with new kinds of hazards such as noise, vibration, and pesticides and other poisonous chemical substances. To help restore our natural environment and to free it of such hazards, environmental education conducts systematic studies of the issues and problems of the natural environment and its improvement, and encourages awareness of the biosphere and its problems.

We face serious environmental problems arising from various causes. Pollution of all kinds is being caused by rapid industrialization without proper waste control, while the number of cars on the roads is increasing at an annual rate of 15 per cent a year and use of energy by 8.5 per cent a year. There is rapid expansion of urban areas due to population growth, and a rapid increase in the number of sewage plants, which now total 18,901. There are also a scarcity of drainage systems in cities and a shortage of money to spend on the prevention of pollution.

The objective of environmental education in primary and secondary school is to give pupils general ideas about environmental preservation and about hazards caused by pollution. This objective applies to education of the general public as well.

In an effort to ease the environmental problems which result, specialized environmental education aims to train experts to deal with these problems and to develop new technology and methods for solving them. It also analyses environmental data and conducts research and investigations into methods of environment preservation.



Opening day at a large primary school

The country has not yet prepared concept maps or concept sequences for environmental education as a basis for curriculum development, but intends to prepare them in the near future. In all primary and secondary schools, environmental education is included in existing subjects. In colleges and universities, students of engineering departments and agriculture departments take environmental education as a separate subject.

Preparation of instructional materials. The objectives and concepts of environmental education are presented in textbooks and through audio-

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visual materials. An example of a learning sequence for graduate students in Environmental Hygiene is as follows:

1. Nutrition	– Carbohydrates, proteins, lipids, minerals and vitamins. – Chemical properties of nutrients. – Methods of analysis of nutrients.
2. Food additives	– Food preservatives, synthetic sweeteners, synthetic colouring agents and others. – Physical and chemical properties and food additives. – Methods of analysis of food additives.
3. Food intoxication	– Chemical and microbial intoxication of food. – Treatment of food intoxication.
4. Drinking water	– Chemical and physical properties of drinking water. – Methods of analysis of drinking water.
5. Water pollution	– Physical and chemical analysis of water pollution. – Treatment of water pollution.
6. Air pollution	– Chemistry of air pollution. – Methods of analysis and treatment of air pollution.

Learner activities. Few activities are undertaken by pupils in primary and secondary schools except attending classes in which they learn through textbooks and teachers. Undergraduate and graduate students undertake some experiments, investigations and field work, guided by professors.

Mechanism and procedure for curriculum development. Various journals, textbooks and research reports are published by government-commissioned academic bodies or universities. For example, the Korean Nature Preservation Association and the National Council for Nature Preservation have issued journals and instructional materials prepared by specialists.

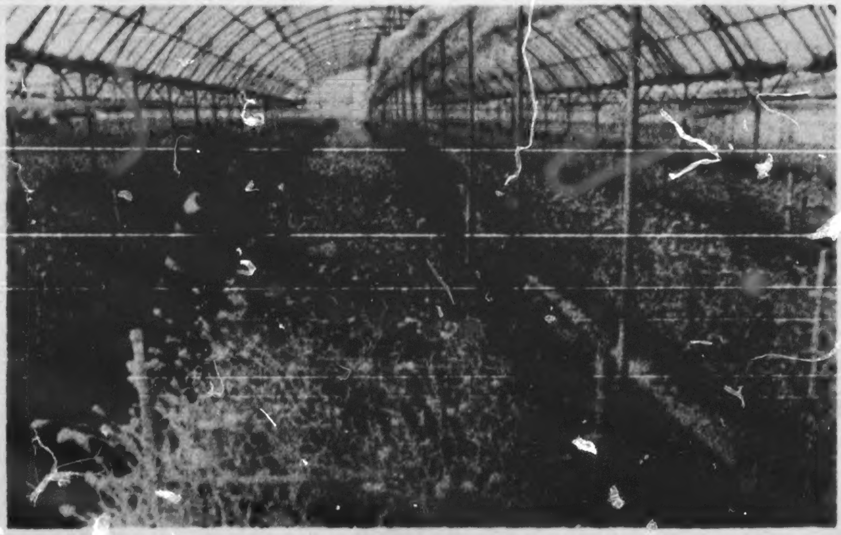
Teacher education

Teacher education programmes. One teacher is assigned to take charge of environmental education in each primary and secondary school. These teachers are given special training by the National Council for Nature Preservation. They are trained to instil in pupils a love of nature and the urgent need to preserve the environment.

Children discover living things outside a large apartment complex.

All teachers at primary and secondary schools are required to be trained to give instructions while teaching subjects related to environmental preservation.

Special teaching materials. Government-commissioned academic bodies prepare and provide to teachers various education materials suitable for environmental education.



Young women working in a modern greenhouse

Implementation

A government committee, headed by the prime minister, draws up national policies and co-ordinates programmes of environmental education at different levels, through the work of other governmental organizations such as the Office of Environment.

Administration and management. With the support of the government, a nation-wide organization of civilians concerned with preservation of the environment was established, called the National Council for Nature Preservation. It undertakes environmental education for all people through its nation-wide branches and various other organizations related to the conservation of nature.

Evaluation. A government survey indicates that, up to 1979, the following results had been achieved through environmental education:

1. Awareness of the importance of preservation of the environment had increased;
2. The public had participated actively in campaigns to keep the environment clean, including communities and nearby mountains and rivers;
3. Environmental education had become a separate subject to be learned by everyone, and many people had attended lectures on the subject;

4. Increasingly more materials for environment education were being prepared, and
5. Academic activities in research and investigation had been invigorated.

Future directions

Environmental education will be directed toward making pupils and the students aware of hazards and threats to humanity resulting from contamination of the biosphere. Methods and techniques for preserving and protecting nature and its resources will be taught. The learning of the Charter for the Preservation of the Environment, the Law of Environmental Preservation and Environmental Hygiene will be included in the curriculum.

Through mass communication and lectures by specialists, the diffusion of environmental information to the general public will be continued to encourage among all people the awareness that the future happiness and even the survival of humanity depends on preserving nature and its resources. □

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SINGAPORE

by Richard Lim

Introduction

In 1970, the Member States of the United Nations adopted a resolution concerning development for the 1970–80 decade. The resolution began, "Recognizing that the level of living of countless millions of people in the developing part of the world is still pitifully low. . . and that while a part of the world lives in great comfort and even affluence, much of the larger part suffers from abject poverty. . . in the conviction that development is the essential path to peace and justice, governments dedicate themselves anew to the fundamental objectives enshrined in the Charter of the United Nations, namely to create conditions of stability and well-being and to ensure a minimum standard of living consistent with human dignity through economic and social progress and development."[1]

The resolution adopted for developing countries recognized the need for a development policy based on converging efforts in social and economic undertakings.

It thus tried to reconcile two opposing forces: the desire for economic growth and the increase of production necessary for social and economic investments on the one hand, and the consideration of the spiritual side of man as the ultimate goal of development, economics representing only one means towards this end on the other.

The Republic of Singapore, like other Member States of the region, has been making rapid economic and social gains, only to find that such development can bring new problems to the total environment.

Environmental problems and issues

Geographical description. The Republic of Singapore has a population of just over 2.39 million (mid-1980) living in an area of 616 square kilometres. This gives a population density of more than 3,880 people per square kilometre, the second highest in the world. The island of Singapore is mostly flat with the highest hill no more than 166 metres.

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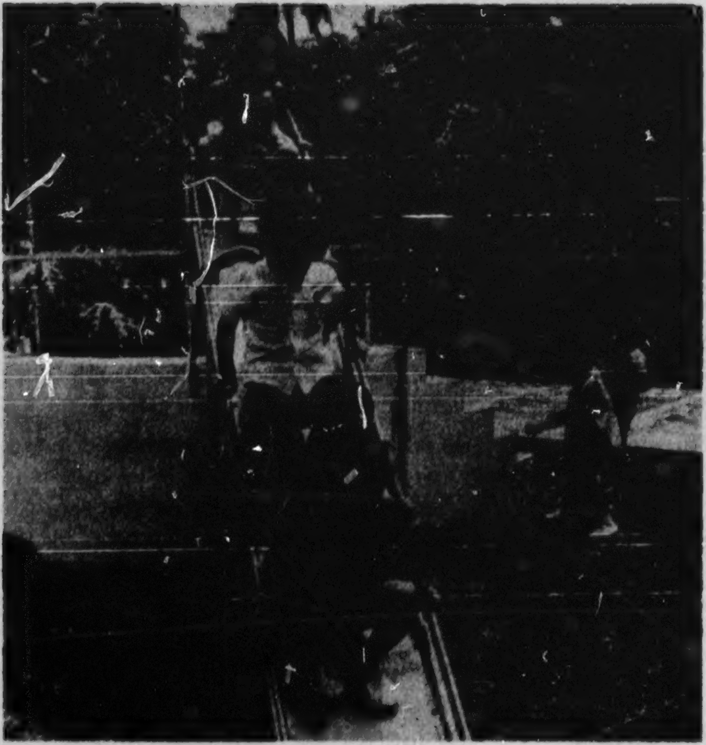
[1] Excerpt from a Resolution of the General Assembly of the United Nations (1970/2726/XXV), reprinted in *International Journal of Health Education* (XVIII/2, p.74).



Much of Singapore is tropical garden, but intensive building has encroached upon this.

Situated almost on the equator, Singapore has a high annual rainfall, high humidity and warm temperature, conditions which can foster rapid bacterial growth, organic decomposition and the propagation of disease-carrying insects.

National policies and directions. Singapore's physical, geographical and climatic attributes together with the current rapid pace of urbanization and industrialization make the island vulnerable to environmental pollution. Hence, keeping Singapore clean is a crucial problem. There are good reasons for seeking to make Singapore a clean, healthy and green garden city. A clean and litter-free city raises national morale and civic pride and means a great advantage in attracting tourists and industrial investments. More importantly, a clean city will improve health and living conditions.

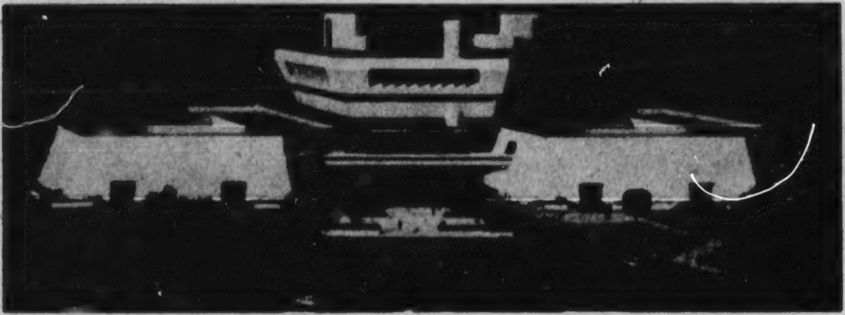
Early efforts toward control of environmental pollution relied mainly on providing an efficient public cleansing service with little or no community participation. It was soon realized, however, that without public co-operation even the most efficient service cannot achieve the desired results.

As a result, in 1968, the "Keep Singapore Clean" campaign was begun in a national effort to make Singapore one of the cleanest countries in the world. A National Campaign Committee was formed, headed by the Minister for Health and comprising representatives from government ministries, statutory boards and private organizations who planned and co-ordinated the activities of the campaign.

A preliminary measure was the amendment of outdated public health laws and the enactment of more effective new laws. The provisions of the new laws had to be publicized and explained to the people during the period of the campaign to gain the acceptance of the majority.

These national educational campaigns, usually lasting a month, have been repeated since 1968 to reinforce the public's awareness of their responsibility and role in improving the quality of the environment. Specific health hazards have been highlighted each year. In 1969 the focus was on the mosquito health nuisance and in 1970 it was on environmental pollution problems. The following is a list of the campaigns from 1968 to 1976:

1968 – Keep Singapore Clean
1969 – Keep Singapore Clean and Mosquito-Free
1970 – Keep Singapore Clean and Pollution-Free
1971 – Keep Singapore Pollution-Free
1973 – Keep Our Water Clean
1974 – Food Hygiene
1975 – Better Food for Better Health
1976 – Combat Infectious Diseases



Model of new Singapore Science Centre

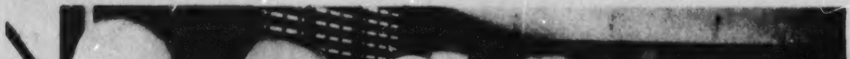
Like most major cities of the world, Singapore is also confronted with the problem of pollution of the environment resulting from rapid urbanization and industrialization. The government realizes that economic development should not be at the expense of social improvement because economic development has as its objective *improved* welfare, including the health of the community.

Formation of the Ministry of the Environment. A major step forward was made in 1972 towards a better environment for Singapore by the formation of a new Ministry of the Environment.

This ministry took over the responsibility of environmental health, including public cleansing, from the Ministry of Health. It also took over sewage and drainage works so that all anti-pollution and related matters could now be dealt with by one ministry, leading to more effective action.

The objective of the Ministry of the Environment is to maintain a high standard of environmental public health and cleanliness through preventive and other control measures. Its functions are:

1. Environmental public health control;
2. Sewage and water pollution control; and
3. Drainage control and flood alleviation.



Public health in the working environment is a matter of concern.

Under the environmental public health division are port health services, epidemiological investigations, vector-borne disease control, food hygiene control, hawker control and licensing, and public health education. 'Environment' therefore embraces a wide area from the provision of modern sanitation to food hygiene to keeping Singapore clean and disease-free.

Major environmental problems and issues

Land scarcity. As one of the most densely populated states in the world, Singapore must cope with heavy demand for land space. Many of its environmental problems are related to urbanization and the rapid development of land. The problems are aggravated by the rapid growth of industries and public housing programmes and the ever-increasing demand for commercial land in the city centre.

Industrialization and pollution. Rapid industrialization and urbanization have increased not only demand for water but also discharges of industrial and domestic effluents. Water and air pollution are subjects of concern for environmental control.

Singapore has no abundant natural water supply so there is a need to conserve water. Water is supplied mainly for drinking, domestic and industrial use, public cleansing and fire-fighting. Consumption must be met within the constraints of land scarcity and high population density. Apart from impounding run-off from the central protected catchments, run-off water from unprotected rural catchments is also now used for the water supply. Use of this lower-quality raw water requires effective pollution control and proper catchment management, through provision of advanced treatment processes.

Water pollution is mainly caused by the indiscriminate discharge of refuse, debris and liquid waste into watercourses. Therefore, water flowing in drains and canals must not be allowed to be polluted or littered.

Solid waste disposal. With a high population density, growing pace of industrialization, improved standards of living, greater use of packaging of consumer goods, and rapid building and demolition, the amount of refuse being disposed of is increasing. Currently, about 2,700 tonnes of refuse are dumped daily in sanitary land-fills or incinerated in a modern incineration plant. The latter method, now used for about half of all rubbish, offers a long-term solution for Singapore, with its land scarcity.

Vector-borne disease. Among the important infectious diseases endemic in the country is dengue haemorrhagic fever (DHF). This disease, transmitted by the *Aedes* mosquito, was first reported in Singapore in

1960. It then became endemic with occasional outbreaks. Major epidemics occurred from 1966 to 1968 and in 1973.

The problem of DHF is that it is a disease associated with urbanization and development, and the creation of man-made breeding habitats in homes and construction sites. But education can play an important role in the control of the disease.

Food-borne disease. The presence of large numbers of street vendors selling food to the public poses a problem of maintaining food hygiene because these hawkers generally lack proper facilities for preparing and serving of food. They also lack proper disposal of discarded wastes, which are thrown on roads and into drains, leading to littering and pollution of the watercourses. Street vendors also create traffic congestion, especially in the city area.

In order to eliminate this problem, while recognizing that hawkers provide relatively inexpensive food, the government in 1971 embarked on a programme to build 'food centres' to house all hawkers so that they could conduct their business in conditions conducive to good food and personal hygiene. These 'food centres' are provided with a water supply, wash areas, sewer connections, protection against pollution, lighting and electricity.

Even with improved facilities, however, knowledge of food and personal hygiene may be inadequate. This is also true for other food establishments like restaurants and coffee shops. Health education is therefore important for hawkers and other food handlers to gain knowledge of hygiene and to prevent serious outbreaks of food poisoning, viral hepatitis, typhoid or cholera.

Environmental education in schools

Environmental education is not taught as a subject in school, but subjects in the school curriculum include content related to the study of ecological and environmental education.

In primary school grades III to VI, emphasis is placed on the main theme 'Man and his Environment' in the science curriculum.

In the secondary school forms III and IV, students can take the subject 'Human and Social Biology' which includes environmental studies.

School participation in mass environmental education. Schools have been actively involved in the National Campaigns since these were first launched in 1968. Students take part in competitions such as slogan and poster designing, quizzes, debates, oratory contests and essay and song writing. Talks are given by guest-speakers, principals and teachers during assemblies and lesson-periods in most subjects, particularly Science, Civics and Education for Living.

Science camp. This is basically a field-based biology camp that is conducted twice a year during school holidays, for both pre-university students and selected teachers-in-training (Certificate of Education 'A' level teachers). It was initiated in December 1978 by the Singapore Science Centre. Field studies of ecological systems include freshwater life in the stream and the pond, coral reef life, the mangrove habitat and other aspects of land and water resources usage. The objective is to create a solid understanding of nature around us and the environmental implications for Singapore.

Education of the general public

Non-formal environmental education aims first at informing the public about environmental health problems and teaching positive health measures that should be adopted to confront these problems. The health problems are those that come under the charge of the Ministry of the Environment, as indicated above.

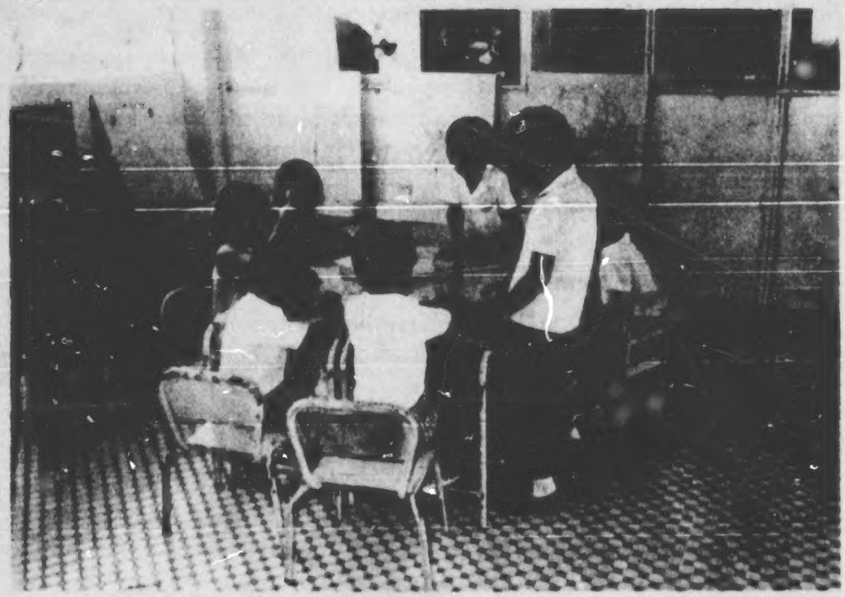
Public education is commonly carried out through massive campaigns and more recently by smaller-scale programmes on specific topics such as food-borne disease, DHF and proper disposal of refuse. Brief outlines of some of the more important of these programmes:

Clean environment and anti-pollution. This educational project aims at creating public awareness of the consequences of littering and pollution of our land and watercourses and suggests ways of preventing this from happening. An eight-panel exhibition display has been produced. Colour slides on various aspects of pollution management are also produced.

Food hygiene. This project is aimed at all food handlers, to encourage a high standard of hygiene in food preparation and handling. Colour slides are produced for educational talks, as well as a series of educational pamphlets and posters. Articles are also written for public magazines,and publicity is given on television.

Vector-control education. This campaign educates the public on the breeding habitats of the *Aedes* mosquito, which transmits dengue fever. As the habitats of the mosquito are man-made receptacles, the people can counter the disease by taking preventive measures suggested by the government. Colour slides as well as pamphlets and posters are produced for educational talks. Exhibits are also made for display at schools and community centres.

Proper disposal of refuse. This project aims to encourage the public to dispose of their refuse in a proper and hygienic manner. Pamphlets are



Young pupils have easels and try to draw birds and animals.

produced and distributed widely to householders and shopkeepers. The message is also highlighted in the press.

To stimulate public participation, educational and publicity materials are produced and distributed. Following the campaign, the exhibits are moved to several community centres throughout the island. Publicity materials bearing educational messages are also made for transmission over radio and television, and the ministry's staff deliver educational talks in schools and community centres, which often follow up with community projects such as 'clean-up' of the neighbourhood.

Teacher-training in environmental education

Teachers-in-training receive instruction on the various aspects of ecological and environmental education through one or both of the following pre-service courses:

1. Teaching of Biology Science (for Diploma of Education students), and
2. Teaching of Science (for non-graduate teachers).

Each course includes discussion of how to teach and to create among students greater awareness of and commitment to ecological, environmental and social issues that have urgent national and international significance.

Implementation of environmental education

Administrative arrangements for mass media. Mass campaigns usually involve the use of newspapers, radio and television to disseminate the educational message. The government-owned radio and television stations in Singapore co-operate and support the ministry by producing news documentaries, interviews, panel discussions and advertising slogans. The local press provides coverage of campaign activities. Editorials often voice support of public campaigns.

Evaluation of programmes. This takes two forms:

1. The Ministry of the Environment holds environmental health talks at schools. At the end of the school talk, accompanied by colour slides, questionnaires are used to gauge the knowledge acquired and the understanding of concepts.
2. Major public environmental education programmes are evaluated by surveys taken before and after implementation. The indicators of effectiveness for some activities would be a drop in the health problem when surveyed, and for others a decline in, for example, food handling offences in a programme to improve food hygiene practices.

Costs. The education section of the Environment Ministry has a budget of about 270,000 Singapore dollars per year.* The estimated annual costs for the five financial years from 1980 to 1985 are given below. Each year shows an increase of about 15 per cent.

1980	S$270,000	1983	S$410,000
1981	S$310,000	1984	S$470,000
1982	S$355,000	1985	S$540,000

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* Approximately 2.2 Singapore dollars (S $) = one US dollar.

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SRI LANKA

by A.A.M.R. Panamaldeniya

Introduction

In Sri Lanka the importance of the protection and improvement of the environment has gained constitutional recognition.

In Chapter VI (The Directive Principle of State Policy and Fundamental Duties), the Constitution of the Democratic Socialist Republic of Sri Lanka, Article 27 (14), declares: "The State shall protect, preserve and improve the environment for the benefit of the community."

In the same chapter, Article 28 (f) lays down a fundamental duty to all citizens: "To protect nature and conserve its riches." It is to be noted, however, that the provisions of Chapter VI do not confer or impose legal rights or obligations, and are not enforceable in any court or tribunal.

The significance of these provisions lies in the fact that they should guide Parliament, the President and the Cabinet of Ministers in the enactment of laws and governance of Sri Lanka for the establishment of a just and free society.

Summary of legislative acts affecting environmental management

Legislation to prevent pollution of rivers, streams and the atmosphere

1. Crown Lands Ordinance and Act (1947-1949).
   These give the State the power to take measures to prevent pollution of public lakes and streams.
2. Thoroughfares Ordinance and Act (1861-1953).
   These make it an offence to throw rubbish or other harmful objects into rivers and canals.
3. Colombo Municipal by-laws.
   These forbid the 'corruption' of water by chemicals.
4. River Valleys Development Board Act (1949-1965).
   This gives power to the Board to make by-laws to prevent pollution of water in its area.
5. Water Resources Board Act (1964).
   This requires the Board to advise the Minister on the prevention of pollution of rivers, streams and other watercourses.
6. The Nuisance Ordinance (1862-1946).

7. Colombo Municipal Council Waterworks Ordinance (Chapter 208).
   This forbids pollution of streams, reservoirs, aqueducts and other waterworks belonging to the Council by:
   - causing the water of any sink, sewer, drain, steam engine or boiler, or other water belonging to any person or under his control to run into any Council water reserve or supply;
   - bathing in or allowing a dog or other animal into any stream, reservoir or aqueduct, and
   - throwing rubbish, dirt, filth or anything else that could cause harm into any stream, reservoir, aqueduct, hydrant, surface-box or other Council waterworks.

Legislation to conserve natural resources

1. Mines and Minerals Law (No. 4 of 1973).
   This vests absolute ownership of certain minerals in the Republic. It regulates mining, prospecting for collection, processing, and sale and export of minerals; provides for the health, safety and welfare of workers in mines; enables the compulsory acquisition or requisition of property for any corporation established to develop the mineral industry; and provides for other related matters.
2. Water.
   Proposals to draft Acts to protect springs, rivers, lakes and tanks, to control and regulate their water and to prevent pollution have been submitted by the Water Resources Board to the Minister.
3. Soil Conservation Act (Chapter 450).
   This provides for the conservation of soil resources, prevention or mitigation of soil erosion and protection of land against damage by floods and drought.
4. Fauna and Flora Protection Ordinance (Chapter 469) as amended by Acts Nos. 44 of 1964 and 1 of 1970.
   This deals with the establishment and maintenance of Strict Natural Reserves, National Parks, National Reserves, Jungle Corridors and Intermediate Zones.
5. Water Hyacinth Ordinance (Chapter 448).
   This seeks to prevent the introduction and dissemination in Sri Lanka of the plant known as the water hyacinth.
6. Plant Protection Ordinance (Chapter 447).
   This legislates against the introduction into Sri Lanka and the spreading of weeds, pests and diseases harmful to useful plants.
7. Forest Ordinance (Chapter 451).
   This consolidates and amends the law relating to forests and the felling and transport of timber.

8. Felling of Trees (control) Act (Chapter 452).
   This Act provides for prohibition, regulation or control of the felling of trees.
9. Fisheries Ordinance (Chapter 221).
   This ordinance amends and consolidates the law on fisheries and on taking and protection of fish in Sri Lankan waters. It provides for registration of fishing boats and regulation of the fishing industry.
10. Chank Fisheries Act (Chapter 213).
   This regulates the taking of chank shells, beche-de-mer, coral and other shells, and controls chank fisheries and the export of chanks.
11. Pearl Fisheries Ordinance (Chapter 214).
   This amends and consolidates the law on pearl fisheries.

Forest law

The Forest Ordinance Act No. 56 of 1979 was passed by Parliament on 30 August 1979. This sets out punishment for offences as follows:

1. Imprisonment for up to five years is mandatory for the following offences in a Reserved Forest:
   - Making a forest clearing,
   - Setting a fire,
   - Felling,
   - Transporting forest produce,
   - Possessing forest produce, or
   - Breaking up land for cultivation, or other purpose.
2. The same term of imprisonment is mandatory for anyone who abets the commission of an offence listed above.
3. Imprisonment for up to two years is mandatory for the following offences in other State Forests:
   - Felling,
   - Transporting forest produce, or
   - Quarrying coal.
4. The same term of imprisonment is mandatory for anyone who abets the commission of an offence listed above.
5. Imprisonment for up to six months or a fine or both will be imposed for the following offences:
   - Failure to comply with the order of a Forest Officer, Police Officer or other authorized officer to stop a motor vehicle, boat or cart, and
   - Obstructing inspection of a motor vehicle, boat or cart.
6. All goods used in the commission of a forest offence will be confiscated.

7. Imprisonment for up to a year or a severe fine or both will be imposed on anyone who is convicted of having hindered an authorized officer in the performance of duties under the Forest Ordinance.
8. New regulations are framed for certain forest and police officers to enter any private timber depot, timber yard, saw mill or carpentry shed and deal with unstamped or unmarked timber found there.
9. Courts are empowered to dispose of forest produce during a trial.
10. Handsome rewards will be paid to informers of forest offences and travelling expenses of witnesses attending courts will be paid.

Major environmental issues and concerns

Environmental problems affecting Sri Lanka are mainly due to increases in population and exploitation of our natural resources for development.

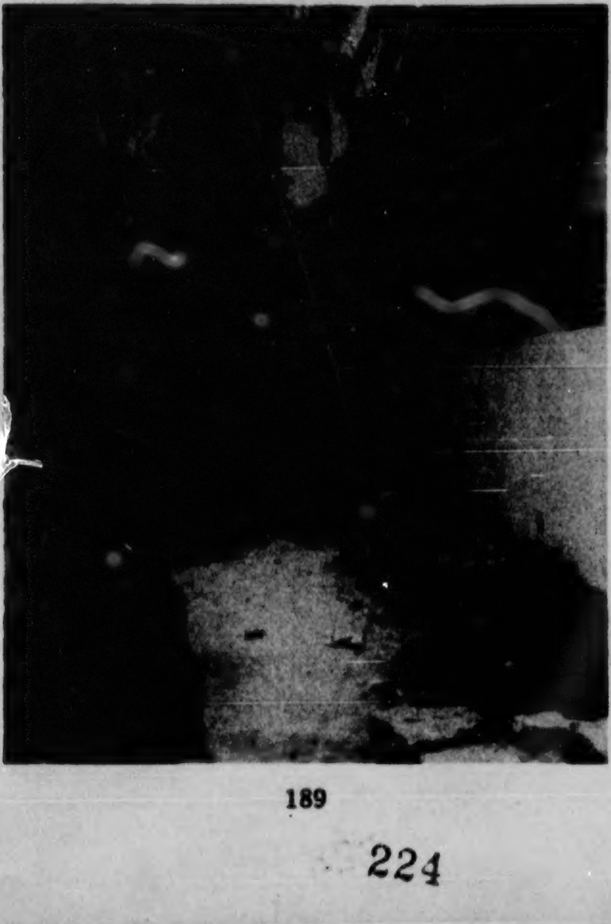
One of our major natural resources is forest. Sri Lanka has a land area of 25,332 square miles, or about 16 million acres. In 1956, 45 per cent of this land area was under forest. Now only 25 per cent of the land is under forest. In 1948 the population of Sri Lanka was seven million; it has now increased to 14.5 million. It is therefore clear that an increase in population results in a reduction of forest area. This reduction has been due to:

1. Clearing land for farms, plantations and human settlements,
2. Gathering wood for fuel, and
3. Cutting timber for direct or industrial use.

Clearing land for development has had adverse effects on the environment. These are:

1. Pollution of water resources,
2. Soil erosion,
3. Destruction of wildlife—particularly birds, elephant and deer, and
4. Increased salinity.

With the construction and expansion of irrigation schemes, provisions are made for new human settlements. These settlements and various industries have spread out to form low-density suburbs. At the same time,



the cities are congested and suffer from blight and slum conditions. The development of settlements has aggravated health problems, mainly by pollution of land, water and air.

Exploitation of mineral resources is vital for a developing country like ours and is indispensable for modern industry.

Two of the oldest industries in Sri Lanka are gem and graphite mining. After mining, the pits are abandoned. Water collects in them and the pits become breeding places for mosquitoes, resulting in the spread of malaria and other water-borne diseases.

Excavation of beach sands for minerals like monazite and ilmenite along the north-east and the southern coasts, rock blasting to clear navigation channels for fishing craft and exploitation of coral reefs have all resulted in deterioration of the sea.

Major environmental actions

1. The Forest Department is now reforesting about 8,000 hectares (20,000 acres) of land. This is being done to improve production as well as to protect the environment. The major trees used are teak, eucalyptus, pinus and ipil ipil.

2. A Division of Environment has been set up under the Mahaveli Development Board. The main function of the Division is to conserve the environment and the wildlife in it while allowing planned exploitation.

3. A Coast Conservation Division of the Fisheries Ministry has been established to prevent the pollution of the coast, sea erosion and the indiscriminate exploitation of the coastal areas.

4. Sri Lanka has established a Man-and-the-Biosphere National Committee, which has undertaken a large number of research programmes, concerned with monitoring and improving the environment. Reserves are set aside with the idea of conserving plants and animals and also in order to conduct basic experimental research.

5. Various voluntary organizations concerned with environment protection have been set up, for example the Society for Protection of Wildlife.

6. Environmental education has been introduced to the school curriculum for grades I to XII.

7. Regulations to prevent forest fires are being strictly enforced. Legal reforms are to be introduced shortly.

8. A central agency has been set up to monitor the affect of development programmes on the environment.

9. A new unit has been set up to co-ordinate all activities concerned with conservation of forest resources, forestry and environment.

10. A scheme is in operation giving priority to tree planting and environment improvement in all projects, both public and private, which affect the physical environment. The Ministry of Land and Land Development has declared that all public agencies and private developers beginning or engaged in the construction of any new buildings, roads and channels must set apart a portion of the land specifically for the growing of trees.

Curriculum development in environmental education for schools

Scope and role. The environment, by definition, comprises the sum total of physical and human resources.

There are in Sri Lanka more than three million children of school age. Humans and their environment are interdependent, and the undisturbed functioning of this interdependence is necessary for human beings' physical and mental health. Therefore this subject should be given an important place in education. Conservation of the environment is a kind of hygiene for society and as such belongs in education.

In-school organization. Environmental education has been introduced into school curricula in Sri Lanka from primary school onwards. Environment is not taught as a separate subject, but it has been integrated with other subjects at different levels. For the primary school child, environmental education is promoted through experiences from Science, Culture, and Society. In grades VI to VIII, environmental education is integrated with Social Studies and in grades X, XI and XII a large part of the Biology course consists of environmental education.

The objectives of environmental education in primary school are:

1. To develop the pupils' ability to observe and understand the nature of their immediate surroundings;
2. To develop the pupils' ability to handle apparatus and carry out simple experiments;
3. To help the pupils understand that living and non-living things in their surroundings are necessary for healthy and comfortable living; and
4. To develop correct attitudes and values.

The curricular content includes the study of the location and nature of houses around the school and the material of which the houses are made. Also included are: water and its uses, how water is polluted, streams, rivers, lakes, soil and soil erosion, cultivation found around houses, local food, pots and pans and local transport. All are introduced in a very simple manner and by observation followed by a series of questions.

In grades VI to VIII, environmental studies have been integrated with Social Science. The objectives are:

1. To understand the surroundings in a systematic way;
2. To understand that the present condition of the environment is due to a variety of influences;
3. To use simple equipment to observe the environment, and record and interpret data;
4. To develop an attachment to the country and one's locality;
5. To appreciate beneficial practices that are accepted by society;
6. To develop wholesome attitudes towards the environment and its natural resources, and
7. To understand the importance of conservation.

The content of the curriculum of grades VI to VIII is as follows:

Grade VI. Location of the school, historical background of the locality and its social evolution, local inhabitants, geographical nature of the locality (rainfall, temperature), natural resources, industries, kinds of employment, needs, stars and planets we can see.

Grade VII. Origin of the earth, nature of the earth, origin of life on earth, ancient man, races of man, beginning of civilization, nature of the island, history of water resources, history of social life and administration of the island.

Grade VIII. Food and agriculture, *chenas* and home gardens, cultivated plants, fisheries, population and health, irrigation, industrialization and development.

In grade X, environmental education is integrated with Science; in grades XI and XII it is integrated with Botany and Zoology.

The content of the curriculum in these grades includes the relationship between environment and organisms; pests and pest control; nutrition levels of the community; science, man and the biosphere; major biomes of the world; natural vegetation of Sri Lanka in relation to topography; rainfall temperature; natural resources and their exploitation; pollution of water, air and soil; and causes and control of pollution.

Out-of-school activities

The Field Studies Centre programme. This is an environmental study programme designed to serve the needs of the advanced-level science students. A field study centre is based on a natural resource—such as a forest, lagoon or river bank—with one or more schools providing organizational support. The programme has as its major aims:

1. The study of the environment at first hand;
2. The provision of opportunities for pupils to work with scientists and experts;
3. The fostering of wholesome attitudes toward the environment;
4. The provision of assistance in environmental studies to specialized agencies and the National Science Council, and the documentation of Sri Lanka's fauna and flora; and
5. Making it possible for youth to be leaders in the conservation of nature and to use the environment as a source for learning.

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Conservation and energy project clubs. These are planned for all secondary schools using the provision in the advanced-level timetable for eight periods per week in addition to the teaching of four required subjects. It is hoped that students and teachers will use extra timetable periods to extend the activities of these clubs. Among the objectives of the programme are:

1. To help students acquire manual and social skills under the operational conditions of project-based activity;
2. To develop attitudes which will encourage students to seek new ways of using national resources;
3. To develop attitudes which will help students perceive threats to the environment and take necessary action;
4. To develop attitudes which will help them cope with energy scarcities;
5. To teach about fuel and energy-saving techniques; and
6. To acquaint pupils with known methods of economically generating power.

The proposed activities of the clubs include:

1. Growing trees in the neighbourhood;
2. Helping in reforestation programmes;
3. Participating in recycling projects;
4. Learning about water-course protection;
5. Adopting neighbourhood forests and groves for environmental studies;
6. Planting fast-growing fuel-yielding trees such as the ipil ipil;
7. Designing and building windmills;
8. Designing and building solar heaters and other solar-powered devices;
9. Designing and building firewood-saving hearths, and encouraging their use; and
10. Learning about the activities of energy project clubs of other schools through the exchange of papers and participation in study camps and seminars.

It is planned to add to the project club functions the organization of creative societies, as required by the Invention Incentive Act of 1979. ☐

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THAILAND

by Kowit Vorapipatana and Vanli Prasarttong-Osoth

Introduction

For many Thai school teachers the term 'environmental education' may still be an unfamiliar one, although they may already be imparting such knowledge to their students without identifying it as such. It is a term, however, which is becoming very important to educators and curriculum specialists together with other new concepts such as population education, drug education and consumer education, and which can be identified in curricula from the elementary (primary) school level up to university, in both in-school and out-of-school programmes.

Environmental problems and issues

National mandate. Under Section 65 of the Constitution of October 1974, which is currently in effect, it is stated that "the State shall maintain the balance of the environment and eliminate pollution that is damaging to public health." This statement indicates national awareness and concern about environmental problems and shows the way for constructive attempts to solve such problems.

In 1975, the Improvement and Conservation of National Environmental Quality Act was promulgated and the National Environmental Board (NEB) accordingly established. One of the most important functions of the NEB is to recommend an environmental development policy to the government. Such a policy was drawn up by the NEB, and has now been approved by the Cabinet. The policy comprises six chapters: General, Management of natural resources, Pollution control, Population distribution, Conservation of nature, and Environmental education.

Major environmental problems. Thailand is now being confronted with increasingly severe environmental problems. There are three background situations which contribute to these problems.

1. *Population increase.* Although the population growth rate has been on the decline as a result of intensified family planning programmes, both government and private, the growth rate still averaged around 2.5

from 1973 to 1978. Population projections for the period 1970-1980 are shown in Table 1. These indicate that each year Thailand has to prepare to meet the needs of more than an additional one million people.

2. *Population distribution.* Concern over population is not limited to size alone but to distribution as well. Population density is highest in Bangkok (perhaps three thousand per square kilometre) and lowest in the Northern region.

3. *Utilization of new technology in agricultural and industrial production.* The use of more fertilizers and insecticides in agriculture in order to improve yields has led to degradation of the soil, and to water pollution. Promotion of industrial development utilizes more energy and also frequently pollutes the environment with industrial wastes.

Table 1. Population projections* 1970-1980 (in thousands)

Year	Whole Kingdom	Males	Females	Population per sq. km.
1970	36 370	18 251	18 119	70.88
1971	37 485	18 815	18 670	73.05
1972	38 592	19 373	19 219	75.21
1973	39 693	19 930	19 763	77.36
1974	40 782	20 479	20 303	79.48
1975	41 869	21 028	20 841	81.60
1976	42 950	21 579	21 381	83.70
1977	44 039	22 125	21 914	85.83
1978	45 100	22 660	22 440	87.90
1979	46 142	23 185	22 957	89.93
1980	47 173	23 704	23 469	91.94

* The projections are based on the 1970 Population and Housing Census, National Statistical Office, adjusted for under-enumeration.

With the above background, the following environmental problems have emerged.

1. **Problems concerning the management of natural resources**

a) *Forest areas.* Forest areas in Thailand have been decreasing rapidly in the past decade. According to the National Statistical Office, in 1975 forest areas constituted only 22.45 per cent of the total land area. The major causes of this decrease are clearing of forests for cultivation, and commercial logging (and poaching).

b) *Soil.* As Thailand is primarily an agricultural country, the majority of Thais depend very much upon the richness of the soil for cultivation. The rapid increase in population leads to a constant demand for more land (an increase of around 2.6 per cent per year). New areas may have low cultivating quality: in some of these areas rice-yields may be only one fifth of those in the better areas. In spite of new clearing, the area of land under cultivation per family has decreased from an average of 16 rai per family in 1963 to 11.6 rai per family in 1975 (one rai equals 1,600 sq. m.).

c) *Unbalanced spatial distribution.* There are great differences in sizes of population among various cities and communities, causing difficulties in the organization of public services.

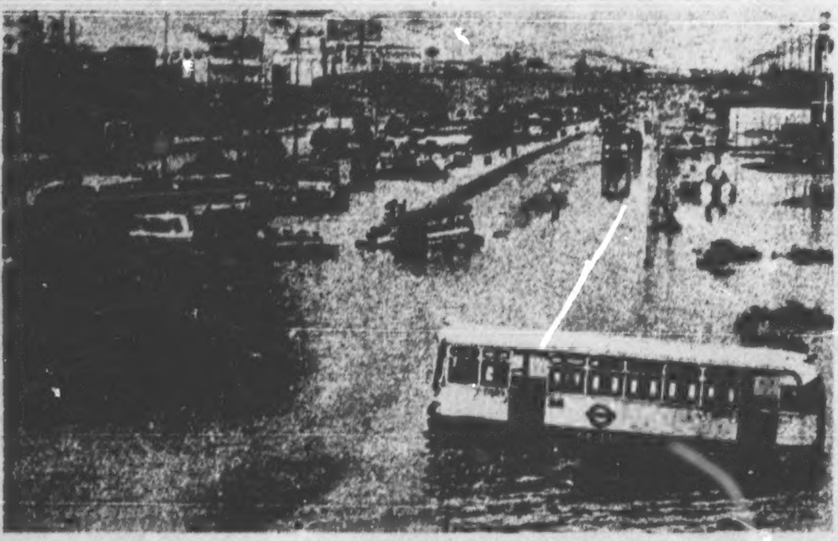
d) *Water resources.* Water shortage is still a major problem in certain areas of population, where rainfall volume is inadequate both in terms of personal necessities and economic production.

2. Environmental pollution

a) *Water pollution.* In certain parts of the main rivers, where there is a high population density, the water is heavily polluted from both domestic as well as industrial wastes.

b) *Energy utilization.* With the great increase in the price of imported petroleum products, Thailand has to concentrate more and more upon the development of local energy sources such as natural gas and lignite. Any undesirable effects such development may have upon the environment need to be anticipated and precautions taken.

c) *Other pollution such as air, noise, garbage and rubbish.* These problems are spreading from the cities to the towns and villages.



Deep floods on Bangkok's superhighway, 1980

Tremendously heavy traffic creates both air and noise pollution, for example. Also, thousands of deep wells have been bored to pump up ground water to meet the city's demand for water. This has led to land sinkage and flooding in parts of Bangkok because the city is only about 1.5 metres above mean sea level.

3. Moves to solve environmental problems. One of the major government actions to solve environmental problems was the declaration of the Improvement and Conservation of National Environmental Quality Act in 1975. Under this Act, conservation measures are regarded as co-operative efforts among various governmental agencies and no agency has been assigned the sole authority and responsibility to undertake such measures.

Under the Fourth Five-Year Development Plan (1977-1981) the following measures were laid out:

1. *Short-term measures*

a) Relevant laws and regulations such as those concerning city planning, traffic, foods and beverages, control of industries, and so on, have to be strictly enforced to prevent environmental problems.

b) Budgetary support must be given to those environmental development projects which are urgent problems or else promote environmental quality.

c) The participation of public as well as private agencies must be encouraged to work to preserve the environment.

2. *Long-term measures*

a) A National Environmental Development Plan should be formulated to serve as a guideline for governmental activities.

b) Co-operation in environmental efforts among governmental agencies must be stimulated to produce mutual benefits in terms of exchange of information and technical knowledge. Such co-operation will ensure that all efforts will be made within the national plan and environmental development policy.

c) Controls and standards for environmental quality should be established so that government and private agencies can use them as guidelines in developing projects. By weighing the advantages and disadvantages these agencies can avoid projects that might have a bad effect on the environment. Firm regulations concerning water and air quality as well as the operation of fisheries must be declared to ensure more effective control.

d) Recommendations should be submitted to various agencies concerned for reorganization of their administrative system in order that they may conduct environmental activities effectively.

e) Public relations activities should be organized to stimulate public awareness of environmental matters. Training in environmental education can help government personnel plan and carry out activities in their respective agencies to promote management and reconstruction of the environment.

f) City planning must be completed throughout the country with careful consideration of environmental problems.

g) Industries must be properly provided with preventive measures for environmental impact control before their establishment can be authorized. The government must also strictly enforce the regulations concerned and close those industries which fail to observe them.

In addition to the above broad outlines,educational activities are also part of the combined effort to promote environmental quality. In the Thailand National Educational Scheme 1977 it was stated under Section 6, Item 52, that "The State shall undertake to inculcate the awareness of the importance of conservation of natural resources and environment as well as population education."

Curriculum development in environmental education

Definition, scope and role of environmental education. From the above-mentioned Thailand National Educational Scheme 1977, environmental education may be interpreted as a learning process to create an awareness of the importance of conservation of natural resources and the environment, and to induce responsible behaviour towards such conservation. Thai educators have further elaborated on this definition, specifying that it is a learning process:

- where students will acquire knowledge and understanding about the environment which they will be able to apply to their daily lives, as appropriate;
- which induces proper attitudes and values concerning environmental and related problems among students; and
- which makes students realize their role and responsibility personally as well as in the community, in preventing or solving problems of the environment and in helping to preserve the life of the earth.

Objectives and strategies for environmental education. The objectives of environmental education may be summed up in general as follows:

a) To induce knowledge and understanding about environmental problems and their causes as well as ways to prevent or solve such problems on a personal as well as a social basis.

b) To create an understanding about the interrelationship between humans and their environment.

c) To induce an awareness of and interest in the environmental problems, both present and past.

d) To induce proper attitudes, values and a sense of responsibility towards conservation of the environment.

e) To demonstrate effective and economical utilization of natural resources.

f) To enable learners to make their own decisions properly and rationally in solving environmental problems.

g) To enable learners to utilize their knowledge about the environment in creating and improving the standard of living on a personal as well as a social basis.

The strategies. Thailand has a completely revised school curriculum from grade I (elementary level) to grade VII (lower secondary level) since 1978, on a one-grade-per-year basis.

At both the elementary and secondary levels there are certain common characteristics. For example, the new curricula are designed to be more functional, with much more integration and less concentration on esoteric subject matter. The curriculum at each level is designed to be complete in itself.

With regard to environmental education, for both in-school and out-of-school programmes there is one basic approach, the problem-solving method. It can also be said that the learning experiences are more process-oriented than content-oriented. Differences among levels of education do exist to comply with the specific purposes and emphases of each.

Elementary (primary) level (grades I–VI)

The new elementary school curriculum, introduced in 1978, is no longer made up of separate subjects, but is divided into four integrated groups of experiences. They are, first, basic skills, which include language and computational skills; second, life experiences, which include social studies, environmental studies, health education, and others; third, character education, covering fields such as ethics, arts and physical education; and fourth, work experiences, providing some pre-vocational training and vocational orientation.

The new curriculum also has three basic orientations—for individual, local and community growth, and for national development. Environmental education can be integrated easily and effectively into such a curriculum especially in the second—life experiences—group. Contents relating to environmental concerns in the elementary school curriculum are listed according to grade in Table 2, overleaf.

Study of forest as a vital resource (grade V)

Discussion follows exploration.

Table 2. Contents relating to environmental concerns in the elementary school curriculum

Grades	Topics
Grades I and II	1. How to clean the house
	2. How to dispose of household garbage
	3. How to help keep the school environment clean, beautiful and healthy
	4. How to behave according to school rules and regulations
	5. How to keep our community beautiful
Grades III and IV	1. Proper foods to eat for good health
	2. How to use household medicines
	3. Consequences of the destruction of plants and animals in our surroundings
	4. Some laws and regulations concerning animal conservation, protected areas and national parks
	5. How to keep our home clean, tidy and healthful
	6. Conservation of natural resources such as the earth, water, air, and trees in Thailand
Grades V and VI	1. Foods to be avoided
	2. Responsibilities as a member of a family and the community
	3. Conservation methods concerning the earth, forests, and water
	4. How to conserve natural resources in Thailand such as trees, minerals, animals, and water
	5. Chemicals in our life such as medicine, insecticides, fertilizers, and detergent, and how to utilize them safely and properly

In all the teaching/learning process at the first level, considerable use will be made of community resources. Out-of-classroom activities are encouraged.

Secondary level (grades VII–XII: three years of lower-secondary and three years of upper-secondary)

The new lower-secondary curriculum is divided into five semi-integrated areas. Within one subject area there is considerable integration (see Table 3 below).

Table 3. Structure of the new lower-secondary curriculum

Subject area	Core			Elective		
	Periods of study per week per year			Maximum periods of study per week per year		
	Grade VII	Grade VIII	Grade IX	Grade VII	Grade VIII	Grade IX
1. Language						
Thai	4	4	4	–	2	6
Foreign	–	–	–	6	6	8
2. Science and Mathematics						
Science	4	4	4	–	–	–
Mathematics	4	4	–	–	–	6
3. Social Studies	5	5	5	–	–	4
4. Character Development						
Health and Physical Education	3	3	3	2	2	4
Art	2	2	–	2	4	6
5. Work Education						
Work	4	4	4	–	–	–
Employment	–	–	–	6	6	12
Total	26	26	20	16	20	46

In this structure an integrated approach is adopted to environmental education by combining it in the areas of social studies and science. At this level the emphasis has been broadened to cover national development. Contents at the lower-secondary stage (grades VII–IX) appear in Table 4 on the following page.

Table 4. Contents relating to environmental concerns in the lower-secondary curriculum

Grade	Subject area and topics
Grade VII	Science
	1. How to prevent or overcome water pollution
	2. Utilization and conservation of minerals
	3. Relationship between humans and their environment
	Social Studies
	4. Environmental conservation at the provincial level
	5. Environmental effects on daily life on a regional basis
	6. Roles and responsibilities towards the community
	7. Regulations on the conservation of our surroundings
Grade VIII	Science
	1. Soils and their conservation
	Social Studies
	2. National conservation of natural resources: forest, animals, water, soil, air, minerals, populations and others
	3. The role and responsibility of the individual
	4. Regulations on the preservation of animals
Grade IX	Science
	1. Effects of population increase on the environment
	2. How to adapt the environment to the benefit of daily living
	3. Causes of deterioration of the environment
	4. Causes of water and air pollution and how to prevent them
	5. Garbage and its disposal
	6. Soil degradation
	7. Effects of energy utilization
	8. Preventive control of noise pollution
	9. How to work toward a balance in nature
Elective courses	Humans and their environment
	– Population distribution and peoples' occupations as related to the environment: utilization of resources; environmental problems; environmental pollution; prevention and revision of laws concerning the environment.
	Thai society
	– Various social problems in Thailand and how to solve them: poverty; land holding for cultivation; illiteracy; crime; juvenile delinquency; drugs; traffic; migration; food deficiency; slums; strikes and national security.

At the upper secondary stage, environmental education is included in a manner similar to the lower secondary stage approach, both by integration in the subject areas and by elective courses in social studies.

Out-of-school. Environmental education is also being integrated into all levels of out-of-school education. The functional nature of the Ministry of Education's out-of-school programmes, with their emphasis on problem solving, makes integration easy. In addition to the Ministry of Education other agencies, both governmental and private, participate in out-of-school education activities, such as radio and television programmes, articles in newspapers, books, journals, pamphlets, special lectures and exhibitions.

Procedures for curriculum development and preparation of instructional materials

Responsible agencies. Curriculum and instructional material development for both in-school and out-of-school education is the responsibility of the Ministry of Education. The two major departments involved in this task are the Department of Educational Techniques and the Department of Non-Formal Education.

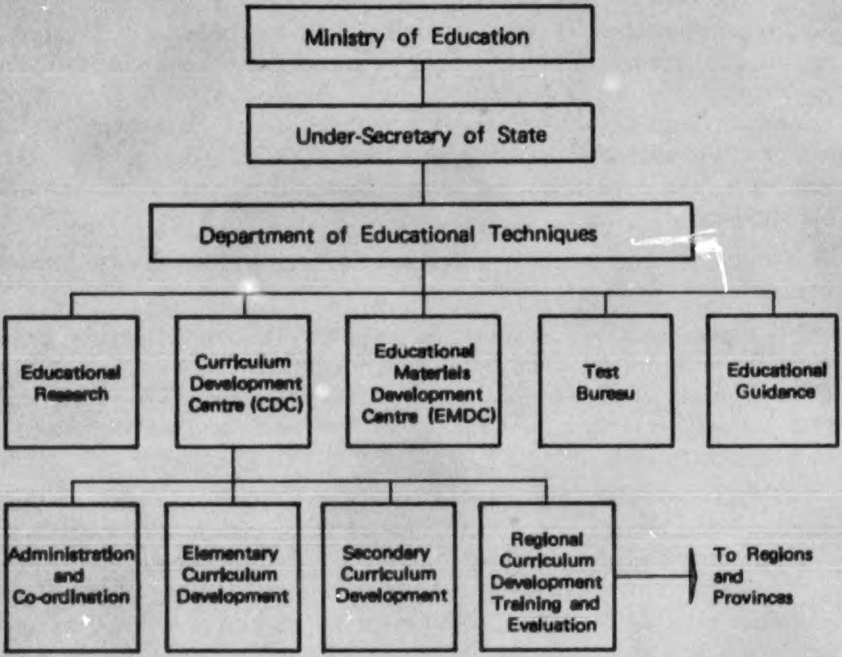
The Department of Educational Techniques (DET) contains the Curriculum Development Centre (CDC), which is responsible for constructing syllabus and curriculum material, and the Educational Materials Development Centre (EMDC), which is responsible for developing instructional materials such as textbooks, supplementary readers, source books and teaching aids (see organization chart of DET and the CDC). There is no special unit directly in charge of environmental education, since it is integrated into the whole curriculum and responsibility for it has been assigned to all sections concerned with curriculum development at all levels.

The Non-Formal Education Department is in charge of developing the curriculum and instructional materials for out-of-school education. Responsibility for environmental education is assigned in a manner similar to that in the DET.

Procedure for development of curriculum. In general the development procedure follows the same general pattern: evaluation of past curricula; preparation of draft objectives, principles and structure of the new curricula; and development of a draft syllabus. Depending upon time and budgetary factors, the procedure may or may not include the trying out and revision of the drafted materials before final implementation.

In all development procedures the participating personnel are recruited from every subject discipline, using subject matter specialists as well

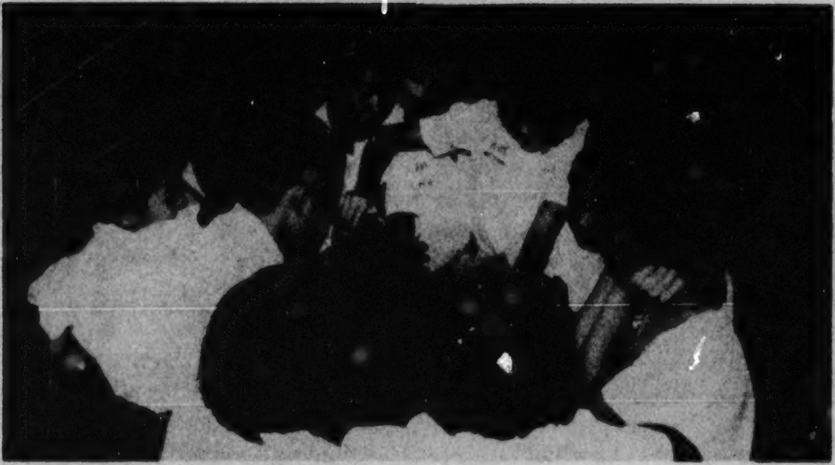
Position and Organization of
the Department of Educational Techniques (DET)
and the Curriculum Development Centre (CDC)


Ministry of Education
Under-Secretary of State
Department of Educational Techniques
Educational Research
Curriculum Development Centre (CDC)
Educational Materials Development Centre (EMDC)
Test Bureau
Educational Guidance
Administration and Co-ordination
Elementary Curriculum Development
Secondary Curriculum Development
Regional Curriculum Development Training and Evaluation
To Regions and Provinces

as teachers at all levels concerned. The specialists and teachers are not limited to the Ministry of Education alone but can come from universities, other governmental agencies or private organizations. For example, experts from the National Environmental Board of Thailand, the Department of Conservation, the Faculty of Forestry of Kasetsart University, the Faculty of Environment and Resource Studies of Mahidol University, the Royal Forest Department, the Ministry of Agriculture, or the Association for Conservation of Wildlife may be consulted—or invited to serve on the curriculum development committee.

Preparation of instructional materials

Instructional materials such as textbooks, teachers guides, teaching aids, source books and supplementary readers are prepared by the responsible agencies on a committee or individual assignment basis. Two examples of such projects appear below. (Private publishers are also allowed to



Studying soil quality (grade V)

develop textbooks which must be submitted to the Ministry of Education for approval before they can be used as textbooks in schools).

Project for preparing a source book on Conservation of Resources and the Environment for the first and second levels

The subject of Conservation of Resources and the Environment, part of the Social Studies,is taught as an elective subject at the lower-secondary level (grades VII-IX). In order to help teachers deal effectively with this new area of environmental education, and to achieve the goals identified in the curriculum, a workshop for the preparation of a teacher's manual was organized by the Population and Environmental unit of the Curriculum Development Centre.

The participants of the workshop were 15 representatives from lower-secondary schools, educational regions, the Curriculum Development Centre and other agencies concerned. The participants were divided into small groups to write the following units: (1) Principal and primary resolution of Conservation of Resources and the Environment; (2) List of references beneficial to teachers; (3) Examples of teaching units, methodology for selecting problems, how to set the issues and use audio-visual media; and (4) Appendix. After revision of the first version, the manuals were produced for distribution to schools.

Special features

The teacher's manual for Conservation of Resources and the Environment prepared under this project is different from its predecessor because it emphasizes the problem-solving approach to teaching. The manual includes various kinds of environmental problems students are likely to face; the teacher can select the problems in the manual considered to be the most important for the local community. Moreover, teachers are encouraged to raise other problems, which may not be covered in the manual but which match existing ones in the students' own locale, following the teaching and learning techniques in the manual as examples.

Project for preparing a source book on Conservation of Resources and the Environment for the First and Second Levels

Resources and Environment Conservation is a subject in the area of Life Experiences, taught at the primary level, and is an elective subject at lower-secondary level. At present, there is a lack of source books on the subject for teachers to acquire additional knowledge, and the Educational Materials Development Centre, (EMDC) is undertaking a programme to fill this gap. Objectives of the project are (a) to give all teachers supplementary knowledge on the conservation of resources and the environment; (b) to provide students and interested persons with basic knowledge relating to this subject; and (c) to promote knowledge, understanding and appreciation of education on resources and the environment among the people concerned.

The EMDC was asked to identify and appoint a group of qualified persons from the higher education institutes with experience and expertise in this field to write the manuscript in accordance with the curriculum. After the manuscript had been drafted, specialists were appointed by the Department of Educational Techniques to revise and edit the manuscript, and then recommend it for approval to the Ministry of Education.

Special features

The source book has many illustrations, various data of resource utilities and a list of wild animals protected by the 1975 Act, with both their common and scientific names.

At present there are available in the market several supplementary readers in environmental conservation for both the first and second levels, prepared by the Ministry of Education and private publishers. As we have seen, a teacher's guide in the teaching of environment and conservation of natural resources is now being tried out for the secondary level. In this useful manual, a number of teaching units are introduced as models for teachers. Each unit focuses on one existing environmental issue problem. Teachers are encouraged to select the units which concern issues on

problems relevant to their localities, or to develop their own teaching unit using the model unit as a guideline.

Teacher education

There is no special training for teachers of environmental education at the certificate level. In the pre-service teacher training programme elective, environmental science courses are offered under general science. Graduate training in environmental studies is provided at universities such as Kasetsart, which offers an M. Sc. programme in Environmental Science, and Mahidol University, which has two master's degree programmes. One of these is an M. Sc. in the Technology of Environmental Management, offered by the Faculty of Environment and Research Studies; the other is an M. Ed. in Environmental Education, offered by the Faculty of Science and Humanities.

For the elementary and lower-secondary levels no special training in environmental education and out-of-school education is considered necessary for teachers who are teaching this subject in an integrated form. The teacher's guide and some in-service training on the teaching/learning process are considered adequate at present.

Future directions

With the population increasing at the rate of over one million each year, leading to an expected doubling of the total population within the next 20 years or so, environmental problems which are closely related to population size have gained more and more attention from the government as well as the general public. In the out-of-school sector, the emphasis is on environmental problems due to detrimental effects of the development process. For in-school education, more emphasis is expected to be put on the individual's interaction with his environment, and on responsible participation in community activities to preserve and improve environmental conditions.

A recent development which concerns environmental education is the recommendation proposed by participants of a Seminar on the Importance of Energy and Food Policy to National Survival, organized by Mahidol University in September 1980. The recommendation states that "The state must campaign vigorously to make people realize the necessity of saving energy and food, utilizing all forms of education and mass communication. . ." If approved by the cabinet this recommendation will become the area to be emphasized in our future educational programmes.

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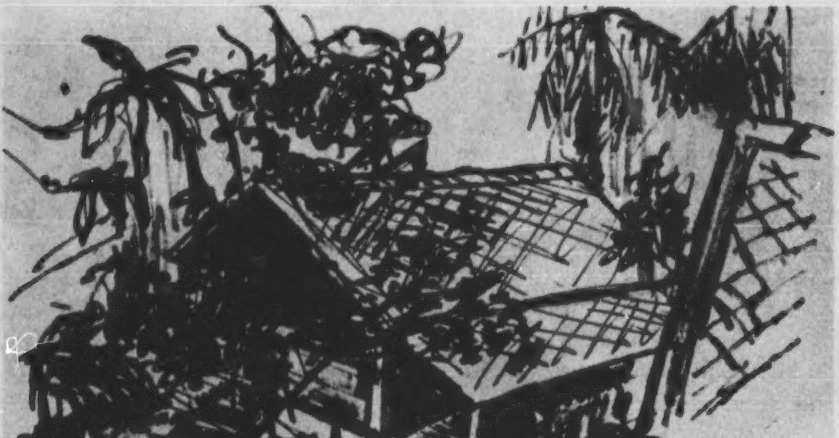

Bulletin of the Unesco Regional Office
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THE UNION OF SOVIET SOCIALIST REPUBLICS

by Sergei S. Khromov

Environmental problems and issues

In the Union of Soviet Socialist Republics (USSR) the solution of environmental problems is regarded as one of the State's most important political, economical and social tasks. Clause 18 of the Constitution of the USSR states: "In the interests of present and future generations the necessary measures are being taken in the USSR to ensure the conservation and scientifically founded, rational utilization of land, its mineral resources, the plant and animal wealth, and the preservation of the purity of the air and water, thus ensuring the reproduction of natural resources and improvement of man's environment."

Right from the early years of Soviet power, a number of decrees (No. 1 was on "Land"), laws and statements have made it possible to regulate the use of the country's most important natural resources.

In the 1950s and 1960s, laws on nature conservation were adopted in all the Soviet Republics. In recent years, laws on health and on rational use and conservation of land and water resources, forests, the earth, animals and plants have been adopted. In 1972 the Central Committee of the Communist Party of the Soviet Union (CPSU) and the Council of Ministers adopted a decree on "Intensification of conservation of nature and the improvement of the utilization of natural resources." Other decrees on conservation have since been passed. The CPSU congresses have recognized environmental problems as important tasks of the State.

In countries with different social systems and in regions that differ in development and economic structure, the consequences of the interaction between society and nature are not always the same.

It is often said that the aggravation of ecological problems is primarily the result of technological progress. Soviet scientists do not agree. In their opinion conflict with nature is not inherent in technological progress, and ecological crises are not inevitable. The main issues are the social and economic relations between people. Often local environmental problems arise because in the production process the mechanisms of natural cycles and the changes occurring between matter and energy are not taken into

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account. Faulty methods are used, too little attention is given to the conservation of nature and environmental specialists are few. By contrast, planned centralized management of the economy, and unity and humaneness of purpose in social production open up prospects for the rational use of natural resources.

While discussing the problems of environmental education we should note that progress is limited by imperfect theory. As far as we know, not one conference or seminar on the theory of the conservation of nature has taken place. Professor I.P. Laptev and other Soviet scientists point out, however, that the study of interaction between society and nature is the subject of a special body of knowledge.

The inadequacy of present environmental theory is shown by the concept that it is necessary to achieve harmony with nature and to preserve its state of balance. We know that society is in a permanent state of contradiction with nature; that is why it is possible to speak about desirable interaction between society and nature rather than harmony. Even more popular is the word 'balance'. The Introduction to the book *Before Nature Dies,* by J. Dorst, refers to the "disturbance of the biological balance."[1] But Engels wrote that a clock is in balance only when it stops. The same principle applies in nature; it can reach a condition of balance only when its development stops. In 1935 the biology theorist E.S. Bauer formulated the principle of stable imbalance and showed that the result of actions of living systems in the environment is the *disturbance* of balance in nature.

Under the influence of natural forces and of man and society, the environment changes and develops. It is important to control these efforts so that we may use them for the benefit of mankind. But if we try to stop the progress of nature, to stop the growth of population, to stop scientific and technical progress, then we merely aggravate the problem rather than solving it.

Main trends in the development of environmental education

Formal education. The diversity of environmental problems makes the development of interdisciplinary scientific research an urgent task. Together with science and practice, the basis of environmental conservation is formed by environmental education.[2]

In the vast territory of the USSR, problems of nature conservation have a specific zonal and geographical character. Therefore the way in which each of these problems is solved depends on the local natural and economic conditions; this in turn determines the regional character of environmental education. The syllabuses vary, depending on local conditions.

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[1] J. Dorst, *Before nature dies*, Boston, Mass. Houghton Mifflin, 1970.

[2] Formerly referred to in Soviet schools as conservational education and now known as ecological education; the Russian translation of environmental education is complicated.

Environmental education is considered as part of all general school education. Its main purpose is to help pupils understand the scientific basis of correlations between society and nature. The leading Soviet academician I.D. Zverev broadened the interpretation of the term "ecological education" and showed its integral character, social trend and the necessity for an interdisciplinary approach.

The first scientific bodies to deal with problems of environmental education in schools were set up within the USSR Academy of Pedagogical Sciences in 1969. These were a Scientific Council and a Scientific Research Laboratory. Together with other organizations, specialists and enthusiasts,

Students planting trees after classes

and co-ordinated by the Section on Environmental Education which unites more than 50 leading scientists and decision-makers, these bodies make recommendations on the structure of environmental education in schools.

Curriculum development is completed by a special programme-method department (different for various disciplines) of the Ministry of Education. In various Soviet Republics action is stimulated by the Instructional-method Letters, sent out in 1972, 1978 and 1980 by the All-Union Ministry of Education.

Objective and scope. The objective of Environmental Education is to develop a system of scientific knowledge, attitudes and convictions that will give pupils a sense of responsibility for the environment. Environmental Education is concerned with both the natural sciences and the social and humanitarian problems that arise from society's interaction with nature.

The necessity of an interdisciplinary approach to Environmental Education is recognized by the majority of Soviet specialists. The Moscow State Teacher Training Institute is working out a common interdisciplinary programme of environmental education for secondary schools. This programme covers all school disciplines; it includes not only the facts, but also the general conclusions and the theoretical background of environmental problems. It will be the basis of environmental education for every discipline. There is an indication of the theme in each subject syllabus and a section where one or another topic from the interdisciplinary programme should be covered. By this means, all the topics of the interdisciplinary programme are distributed between all the disciplines.

The introduction of such a programme will fix not only the extent of environmental education, but also its application in separate school disciplines and will make the whole process of teaching more effective and co-ordinated.

While recognizing the importance of the interdisciplinary system in Environmental Education, many Soviet specialists also point out the importance of the so-called 'junctions of integration' of environmental knowledge. At various levels of education, the interdisciplinary approach can be achieved in different ways. These junctions could be the interdisciplinary lessons where, under the guidance of various subject teachers, problems of man and the biosphere are considered as a whole. They could be lesson-debates when specialists in environmental problems are invited to speak, or a system of make-believe games or practical studies in a natural environment that help pupils to put their knowledge to practical use.

For those completing school, an integrated programme "Man and the Biosphere" has been worked out in co-operation with other member states of the Council of Mutual Economic Assistance. Its title accords with the Unesco programme of that name. There are two variations of 35 and 70 course periods respectively. The necessary learning materials have been prepared, and the programme is being introduced at experimental schools. The object of this course is to bring together the various disjointed pieces of ecological knowledge which have been acquired in studying different subjects, and to use this knowledge to help solve national and global environmental problems.

The Soviet version of this programme envisages, apart from theoretical studies: field practice, a seminar, an interview with environmental specialists, a debate, an excursion and a competition and school exhibition on nature conservation problems. Emphasis will be put on development of the ability to evaluate and make decisions. It is expected that the students' sense of civic responsibility will be indicated by their skill at propagating ideas about nature conservation. For this reason, senior pupils will take part in the arrangement of a school exhibition on International Environment Day.

There are two versions of the course: four periods of study a week during the first or the second half of the year, or three periods a week for three-quarters of a year. After one introductory period, students begin to study the first theme "Biosphere Knowledge—the natural science basis for nature conservation" lasting 17 periods. It covers the following problems:

1. The biosphere as a part of the physical world and the state of its development, based on the work of V.I. Vernadski, founder of biosphere studies;
2. The organization of the biosphere;
3. Stability in the biosphere as a result of evolution, and the role of living matter in the creation of life on earth, and
4. The geographical environment and interaction between society and nature; transition in the management of natural resources; the ionosphere—a new stage in the development of the biosphere.

The second theme "History of the interaction between nature and society" takes up 24 periods of which four are used for an excursion and two for a debate. The main topics covered are:

1. Nature and society, their interaction and the history of their development; scientific and technical revolution, urbanization and perspectives; the beginning of global work on the interaction between nature and society;

2. The decisive role of a social system in the interaction between nature and society;
3. Activity of man as a new factor affecting the environment, the consequences and their evaluation, and
4. Problems of the conservation of nature.

The route of the excursion is chosen to study the effect of man's activities on the natural elements of the locality and the correlations between them. Later, the results of the excursion and material from an interview are used for a debate on one of the local environmental problems.

Twenty-eight periods are allotted for the study of the third theme, "Optimization of the interaction between nature and society (nature conservation)." Three periods are set aside for the seminar, four for a game and eight for practice. The following problems are discussed:

1. Elaboration of the scientific basis for environmental changes and management; limits of stability of the ecosystem and their definition;
2. The system of nature conservation in the USSR; its legislative basis; the economic basis for rational use of natural resources; State management of nature conservation in the USSR; public organizations involved in nature conservation; and
3. International co-operation in nature conservation; the environmental activity of the United Nations; the role of international non-governmental organizations.

The seminar is on the topic: "Possibilities for the solution of environmental problems in a highly-developed socialist state," and makes use of information from an interview, from newspapers and magazines, and from the students' own essays.

The game is based on an international conference on nature conservation and involves the 'defence of a diploma'. It includes the organization of a school exhibition on various environmental topics.

The introduction of such a course does not mean that the interdisciplinary approach is neglected. The synthesis and generalization of knowledge in the leaving Form, together with periodic junctions of integration of the ecological knowledge acquired in various learning disciplines, would help to create a clearer understanding of the complex environmental problems and develop an ability to solve them. At the same time the basic content of environmental knowledge is acquired through lessons on different subjects.

A concise account of the basic scientific content of natural environmental problems included in the various subject programmes is given below. Students are from 7 to 17 years old and they study for ten years from Forms 1 to 10. There are three stages:

Stage I (Forms 1–4)

a) The composite elements of nature;
b) An elementary understanding of the cause-and-effect links in nature, primarily in consideration of seasonal changes;
c) An understanding of the interaction between plants and animals and the elements of inanimate nature;
d) An accumulation of scientific facts on man's positive and negative influence on natural objects and the links between them;
e) Man's economic activity in different seasons and his dependence on local natural conditions;
f) A general idea of the economic significance of nature;
g) Knowledge about measures to control pollution; and
h) Evaluation of the popular experience in forming a reasonable attitude towards nature.

Stage II (Forms 5–7)

a) Interdependence of phenomena in animate and inanimate nature;
b) The first concepts of the conditions needed for life, of the medium in which organisms exist, and of their interrelations with other organisms and the environment;
c) The influence of animate on inanimate nature;
d) Introduction of the term biosphere;
e) The study of scientific methods of preventing the undesirable influence of man's activities on links within nature;
f) Historical facts, reflecting the growing role of natural resources as one of the sources of society's progress;
g) Access to information on the economic development of different countries which depend on the exploitation of natural resources; and
h) An analysis of information on nature conservation in the districts where the pupils live, and on the development of their economies in natural conditions.

Stage III (Forms 8–10)

a) Understanding the universal character of interrelations between natural phenomena in their development;
b) Learning the essence of the unity of society and nature;
c) The concept of a natural medium, of the inter-connections between its components at various levels: molecule, cell-tissue, organism, population-species, and biosphere;
d) Balance and imbalance in nature;

e) Study of the biosphere, its structure, components and energy;
f) The role of green plants;
g) Evaluation of the interaction between society and nature, depending on the social and political structure;
h) Learning scientific facts about man's impact on nature;
i) Forms of pollution, permissible norms and measures to prevent it;
j) The concept of environmental and social hygiene;
k) Measures to conserve the gene pool;
l) State and international measures on nature conservation and the use of natural resources;
m) Ways of changing ecologically inefficient technology; and
n) Creation of optimum conditions in the biosphere, and the concept of the ionosphere.

The system of interdisciplinary links is shown in Table 1.

Table 1. How environmental problems are studied in school subjects

Natural History (Forms 1–4): Natural environment factors. Natural wealth of home district. Seasonal changes and man's work in nature. Legislation. Careful use of natural resources.

Biology (Forms 5-10): Man's impact on natural interlinks (ecosystems, populations, biosphere). Role of animate nature in man's life. Hygienic aspect of nature. Plants. Balance and imbalance in nature.

Geography (Forms 5-10): Development and inter-connection of natural complexes. Economic activities and nature. Estimation of resources and their distribution. Planned use of nature in the Soviet Union.

Physics and Chemistry (Forms 9-10): Impact of modern production on nature. Recycling. Reclamation. Pollution control.

History, Social Sciences (Forms 4-10): Government actions on nature conservation. History of the nature conservation movement. The Communist Party and its programme of environmental management and nature conservation. Legal and moral norms governing the interrelationship between man and nature. Civic responsibility for the fate of the environment. Regularities of the inter-connections between nature and society. Social environmental practices conditioned by historical factors. The USSR Constitution, as it relates to the necessity to regulate the management of natural resources and to nature conservation itself.

Literature and Art (Forms 1-10): The moral basis of links between man and nature. Nature depicted in art. The beauty of nature as a source of aesthetic feeling and the moral improvement of man.

Hand Work (Forms 1-10): Nature as a medium for man's work. Participation of schoolchildren in practical activities to improve the environment and reproduce natural wealth.

A summary of the content of the theoretical lessons and practical activities during field practice organized by the staff of the Institute for the Content and Methods of Teaching, a section of the USSR Academy of Pedagogical Sciences, is given in Table 2.

Table 2. Field practice organized for pupils by the Institute for the Content and Methods of Teaching

Type of activity	Content
Study of biological communities for the purpose of making an inventory of nature's wealth	Description of the types of plant communities. Study of the variety and inter-connections between the species, and of species of relicts and endemics. Peculiarities of the way of life of species (*i.e.*, ants, birds, ungulate animals), structure of populations, dynamics of their numbers; study of the types of environment.
The art of finding one's bearings on the ground. Methods of scientific investigations	Finding one's bearings, using a compass and natural landmarks, walking along the azimuth, setting up experimental plots and making maps of them. Learning methods of systematizing species in nature. Keeping a journal, reports, essays.
Practical nature conservation activities	Study of the need for artificial nesting grounds in different types of forests. Building and hanging of the nests. Inspection and reports on the colonies. Repairs to and cleaning up the nesting grounds. Work on bird feeding tables. Care of the forest. Cleaning recreation areas and living sites.

Tuition during field practice includes fixed-route excursions, individual and group observations, and studies and practical work on nature conservation.

In an attempt to extend modern ideas on nature conservation, some teachers run optional courses at school. The programme for the optional course Nature Conservation of 70 periods for Form 8 was approved by the USSR Ministry of Education in 1973. It includes both theoretical and practical studies and contains the following topics (with the number of periods allotted in brackets): Introduction (4), Scientific basis of nature conservation movement (12), Atmosphere control (6), Water control (8), Soil use (10), Plants (10), Wildlife management (10), Mineral resources (5), Landscapes (5), Tourism and nature conservation–out-of-class (6). Some of the periods are assigned to practice.

The Karelian Autonomous Soviet Socialist Republic has its own special programme for two years of study of nature conservation problems in Forms 7 and 8. In Yakutia teachers conduct optional lessons on hunting and rational use of local resources. Optional lessons on the biosphere and its problems are being run in Lithuania, Estonia, Moldavia, Ukraine and other republics.

Out-of-school education and informal activities. Practical activities concerning nature conservation have become widespread in Soviet schools. They are carried out by the teachers as extracurricular activities and by various educational establishments such as stations for young naturalists, pioneer camps and field stations. Many pupils are members of the All-Russia Nature Conservation Society, and take part in its activities.

Participation of young people in the movement to preserve the environment takes various forms, depending on the needs of their district. There are: 'Green Patrol' and 'Blue Patrol' groups, school forestry organizations, groups to combat soil erosion, work and rest camps, clubs of young naturalists and friends of nature, and expeditions.

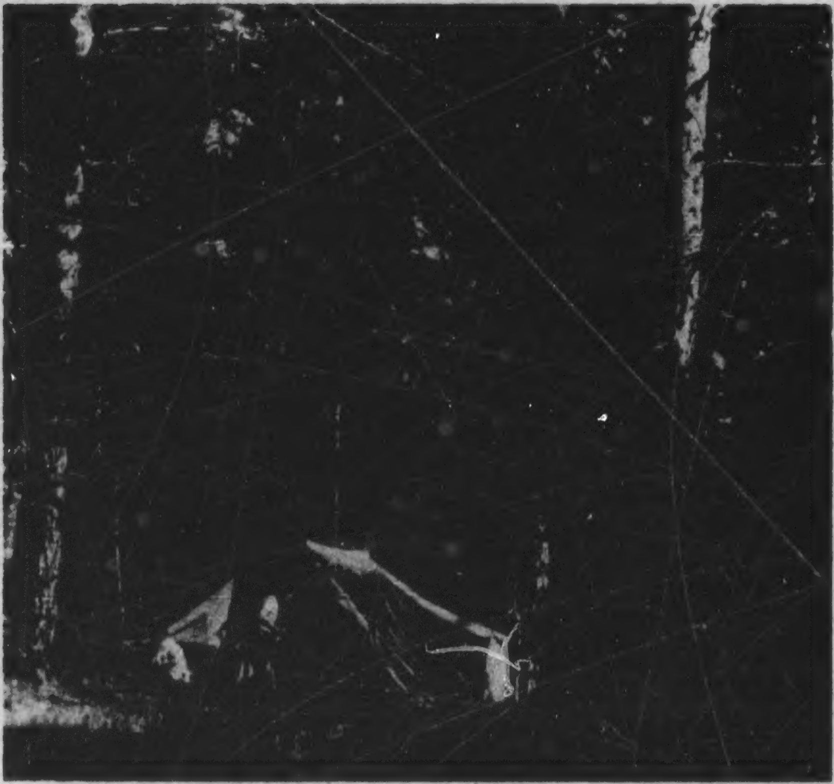
In the Russian Soviet Socialist Federative Republic alone there are more than 6,000 school forestry groups, where more than 300,000 pupils work and study, looking after 2,500,000 hectares of forest. There are more than 1,000 work and rest camps for members of these forestry groups, and nature conservation schools are set up in the camps.

School forestry groups help pupils to choose a career. In 1976 some 600 forestry group members entered forestry institutes after leaving school, and a similar number took jobs in forestry.

Members of school forestry groups take part in the *Muravei* (Ant) operation being conducted by the All-Russia Nature Conservation Society and the Ministry of Forestry. Last year more than 140,000 anthills were put under protection of the young forestry specialists.

'Small Forestry Academies' (SFAs) and 'Youth Ecological Stations' are spreading. One of the first SFAs was organized in Petrozavodsk in 1971 and is attached to the Karelian Forestry Institute. The SFA students have graduated from young naturalist clubs, or are the members of the *Berendei* forestry or winners of various Biology competitions. Most are 14 or 15 years old.

Scientists at the Forestry Institute worked out the course 'Forestry and nature conservation' for SFA students, with 56 periods of lectures, 40 for practice, 10 for excursions and 3 weeks of forestry practice. When studying for the second and third year all students have their own scientific instructor and an individual plan of work. To complete each year of study, students present the results of their scientifically-based investigation in written form. Upon graduation they get a diploma, a description



Field laboratory in a national nature reserve where students specialized in ecology can carry out their investigations

of their abilities and behaviour, and a recommendation to enter a Forestry Institute to continue their education.

There are similar academies in Krasnoyarsk, Sverdlovsk, Omsk, Arkhangelsk and Volgograd. Not long ago, a Correspondence SFA was opened in Byelorussia. Teenagers may study there for three years at either of two faculties: Forestry or Nature Conservation. Everyone can receive the programmes, themes for essays and tests. Those who succeed are invited in the summer to a camp where they practise forestry and listen to lectures by specialists.

In some places, for example in Pushino in the Moscow area, several school forestry groups are united and youth ecological stations are set up. The main objective of the Pushino ecological station is to study the impact of the rapidly-growing town on its environment. Great attention is also paid to the development of technical skills, and schoolchildren are taught handicrafts.

The children inspect the district, mark on a map the areas needing protection from erosion, carry out tree planting and collect the seeds of grasses used to prevent erosion. Blue Patrol groups take part in the All-Union activity called "Living Silver". Pupils mark on a map places where fish may gather in spring, and carry out activities to save fish. They also study flora and fauna in local reservoirs, keep them clean and stage campaigns against poaching. Now there are nearly 7,000 Blue Patrol groups with more than 130,000 members. The results of nature conservation work carried out by pupils are put together at regional, provincial and republican rallies to promote conservation.

Vocational, technical and secondary specialized education. In recent years more and more Form 8 school-leavers have been continuing their education at vocational and technical colleges or secondary specialized educational establishments. In three years of study, students complete the general school curriculum, and acquire a professional qualification.

How environment problems are studied depends on the type of college. For example, at agricultural colleges special attention is paid to rational use of soil, problems of erosion, the effect of forestation on the crop yields, control of pollution of agricultural lands caused by the use of pesticides, and proper methods of irrigation.

In architectural colleges, pupils examine the problems of preserving natural complexes, ensuring that buildings blend into the landscape and planting greenery. Considerable attention is paid to the practical work of improving the local environment. Students look after parks and cultural landscapes, and plant trees and bushes.

Although advances have been made in environmental education at secondary specialized educational institutes in the USSR, the institutes still lack staff qualified to teach environmental subjects as well as teaching aids, and especially textbooks.

Ecological teacher training. Environmental problems are included in most of the disciplines taught to students of all institutes. The first time they come across the scale and significance of this sort of problem is when they take the course Introduction to the speciality in their first term.

The development of ecological knowledge is achieved not only by the interdisciplinary approach, but also by the special course Nature conservation , started in 1948 at the Biology Faculty of the Moscow State University and at the Tomsk State University. By the end of the 1970s,

Students making laboratory tests at a sewage-treating station

environmentologists with the following specialities had been trained at the tertiary level:

- rational utilization of water resources and rendering industrial sewage harmless;
- water supply, sewage and purification of industrial sewage;
- agricultural water supply, irrigation and protection of water resources;
- ichthyology and fish-breeding;
- forestry;
- use of gas and black oil and protection of the atmosphere for the speciality 'Industrial heat-power engineering';
- technology of the recuperation of secondary materials;
- hygiene, sanitation and epidemiology;
- rational utilization of natural resources and environment protection for the specialities Biology and Geography;
- ecology, utilization of natural resources and development of their effectiveness.

Not long ago new specializations Architectural Ecology and Building Ecology were introduced in architectural institutes.

Absent from the list of school teacher professions is an Ecology specialization. This situation will not change greatly in the near future because of the decision to give environmental training to all teachers to make a success of the interdisciplinary approach in environmental education at school level.

The course of Nature Conservation was introduced at a number of teacher-training institutes at the beginning of the 1960s. A compulsory course on environmental problems was started in 1970 at all teacher training institutes. Only a few students enrolled, mainly from faculties with specializations in Biology with Chemistry, Chemistry with Biology, Geography with a minor in Biology, Pre-school Pedagogy, and Pedagogy and Methods of Primary Education. Thus, only biology, geography, chemistry and primary school teachers are specially trained in this field.

Practice teaching is considered one of the most important aspects in ecological teacher training. Though beginning students in this subject may have theoretical and even practical knowledge, they still cannot use it according to the objectives of ecological education at school. This means that the ability to use knowledge depends not on its extent but on its accuracy, systematic character and mobility. The mobility and ability to control and adjust knowledge within the school programme enables students to carry out ecological education effectively at school. It is noteworthy that practice teaching changes students' attitudes towards their studies. After they have tried in practice to use their vocational knowledge, they begin to understand that their special training needs some improvement.

To improve the ecological training of teachers and Environmental Education at school the All-Union Minsk Conference (1979) recommended the introduction of a compulsory course of ecological education for students in all faculties at teacher-training institutes. At the Tomsk teacher-training institute and some others, such a course has been taken by all students for a number of years.

A system of post-graduate training in ecology is also used. In Estonia in 1968, for example, the Nature Conservation Society in co-operation with the Estonian Ministry of Education introduced a new type of summer school training for ecological teacher-training. All teachers–including primary school teachers–and headmasters attend for two weeks. Of 100 periods, ten are allocated for lectures and the rest for field practice. Similar summer courses at some of the nature reserves are organized by the institutes of post-graduate teacher-training in Moscow, Vilnius and other cities.

Future directions

Taking into consideration the wide range of Environmental Education problems, and the fact that many ministries, educational institutions, scientific departments, public organizations, mass media and others are involved in the process of Environmental Education, the co-ordination of these activities becomes an important task. In the USSR the main body in this field is the Section on Environmental Education which co-ordinates more than 50 leading scientists, specialists and decision-makers. At present this body is controlling the enactment of recommendations adopted by the First All-Union Conference on Environmental Education, Minsk 1979. An analysis of materials presented to this conference and of previous experience indicates that in compiling Environmental Education syllabuses and programmes--and in implementing them--the following directions should be taken:

- the plurality of Environmental Education objectives;
- the interrelation and continuity of Environmental Education; each member of a society must have the opportunity to acquire and extend his environmental knowledge;
- co-ordination of the general and individual; the development of the general ecological culture of the people should be co-ordinated with specific local needs and priorities;
- stimulation of the environmental activity of each citizen; and
- the implementation of Environmental Education programmes which should take into account forecasts of the extent of exploitation of natural resources.

To end this article it must be emphasized that no matter how well the problems of the environment and Environmental Education may be solved in one country, even in such a big state as the USSR, it must first of all be considered a global problem that cannot be solved any other way except in close co-operation with other countries. This was underlined in Tbilisi, where we can note the success of the Unesco-UNEP International Programme on Environmental Education. Within the framework of that programme, the following activities could be suggested:

a) In addition to the Unesco-UNEP environmental education newsletter *Connect*, the publishing of a periodical specialized magazine dealing with the problems of Environmental Education;

b) In accordance with the recommendations of the Belgrade International Workshop, 1975, to work out and publish the second edition of *Trends in environmental education* (see p. XIII);

c) Holding a scientific workshop or conference on the theoretical problems of nature conservation, possibly in co-operation with the International Union for the Conservation of Nature and its Resources (IUCN); and

d) The expansion of a system of international courses on Environmental Education wherein representatives of both developing and developed countries are invited. We plan to conduct such courses next year in Tbilisi.

The foregoing does not limit the possible trends of development of international co-operation in Environmental Education. We are confident that no matter how aggravated environmental problems have become, man can solve them now and in the future.

One of the necessary conditions for such a solution is peace on our planet. Environmental problems cannot be solved when military operations continue to take place, when chemical, bacteriological and nuclear weapons with their tests are not banned. At the Regional Workshop on Environment Education in Bangkok, 1980, it was noted that the problems of disarmament and the policy of detente should be subjects in Environmental Education. As they are Environmental Education factors we should not be afraid to introduce such questions. □

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ENVIRONMENTAL EDUCATION: AN INDISPENSABLE MEANS OF SOLVING ENVIRONMENTAL PROBLEMS

by D. Phantumvanit and R.M. Lesaca

Introduction

This article sets out some of the environmental issues in Asia and the Pacific and considers the role of environmental education in improving the environment. Some major environmental issues are presented, followed by an appraisal of environmental education including recommendations for future action.

The terrain of the region of Asia and the Pacific is diverse and complex, ranging from the deserts of Iran, Afghanistan, Pakistan, India, China and Mongolia through the Himalayan mountains of South Asia to the coastal states and island countries of tropical Southeast Asia and the islets of the South Pacific. The region includes the two most populous countries of the world, China and India. Economically, most of the countries are classified as developing; the exceptions are Japan, Australia and New Zealand. A few countries are emerging also as economically strong, including Singapore, the Republic of Korea and Malaysia. On the other side of the coin, there are eight 'least-developed' countries in the region: Afghanistan, Bangladesh, Bhutan, Lao People's Democratic Republic, Maldives, Nepal and Western Samoa.

With such a divergence in stages of development and economic background, not to mention social and cultural differences, it is not surprising that environmental issues are accordingly diverse and complex.

Population and use of resources

With well more than half of the world's population living in Asia and the Pacific, and with all trends indicating an increase of at least another thousand million people in the region by the year 2000, the impact on the environment from population pressure is indisputable. The rapid growth of population has handicapped governmental efforts to eradicate poverty, has depleted available food and energy resources, destroyed vast forests and encroached upon limited natural resources such as land and water.

The World Bank has made a hypothetical projection of the population in different countries of the world to their maximum likely totals. Should these projected figures materialize, the world's population would stabilize in the 22nd century at just under 10 thousand million (9,800 million) people—

double the present population. There are ten countries in the Asia and Pacific region with a projected population of more than 100,000,000:

a) Bangladesh-314 million by the year 2160 (143 million by the year 2000);
b) China-1,555 million by the year 2065 (1,251 million by the year 2000);
c) India-1,645 million by the year 2150 (974 million by the year 2000);
d) Indonesia-350 million by the year 2155 (204 million by the year 2000);
e) Iran-102 million by the year 2105 (59 million by the year 2000);
f) Japan-134 million by the year 2105 (131 million by the year 2000);
g) Pakistan-332 million by the year 2150 (139 million by the year 2000);
h) Philippines-126 million by the year 2075 (75 million by the year 2000);
i) Socialist Republic of Viet Nam-149 million by the year 2105 (87 million by the year 2000); and
j) Thailand-103 million by the year 2095 (68 million by the year 2000).[1]

Asia's increasing population represents an additional burden which is hampering governmental efforts to raise standards of living and to eradicate poverty. To arrest this increase requires stringent and vigorous governmental measures. The example of China in controlling its birth-rate indicates that this problem can be solved if a government is determined to act.

Urban congestion

The continuing increase in population is likely to accelerate the already rapid migration from rural to urban areas. In developing countries, cities serve as the centres of economic, cultural and social activities. The Global 2000 Report has projected that by the year 2000 Calcutta will have 19.7 million people, Bombay 19.1 million, Seoul 18.7 million, Jakarta 16.9 million, Karachi 15.9 million, Teheran 13.8 million, Delhi 13.2 million and Manila 12.7 million.[2]

At present, few cities in developing countries of Asia and the Pacific region can afford to provide adequate sanitary and environmental facilities to serve their population. This problem will become even more acute as congestion is aggravated by uncontrolled urban growth. The environment may be ruined by air pollution from motor vehicles, water pollution from untreated domestic wastes, lack of facilities for the collection and disposal of solid waste, traffic congestion, shortage of housing which leads to expansion of slums, and social insecurity caused by high crime rates.

Events portrayed in this dark picture are not inevitable. The success of Singapore in improving the quality of its environment should be noted. Through vigorous family planning programmes, Singapore intends to limit its population to a manageable level of 4,000,000 people. At the same time, it has introduced successful 'restricted zones' to alleviate traffic congestion in central areas. Its stringent policy on control of pollution has improved the quality of the environment in residential areas. Although Singapore can now be described as an industrialized country and industrial plants and factories are spreading rapidly within its restricted land area of only 588 square kilometres, visitors can still find plenty of 'green' areas even in the heart of town. Singapore has also enforced strict gun control and is one of the world's safest cities to live in.

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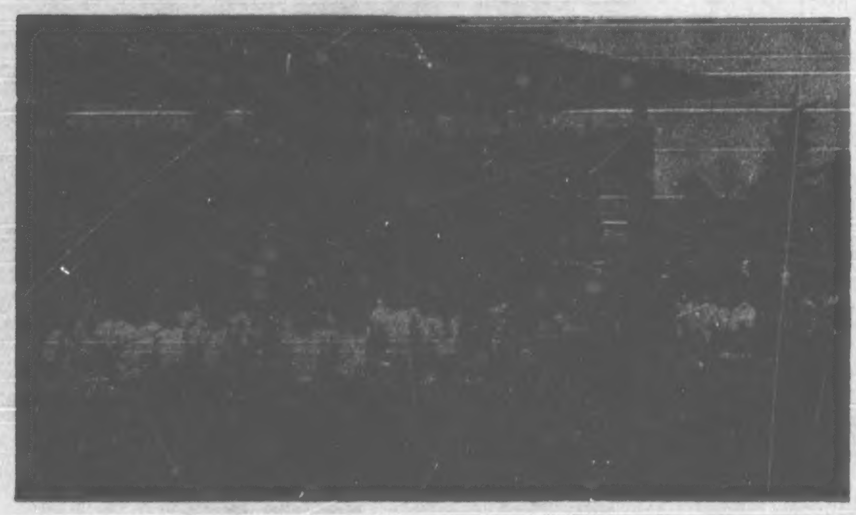
[1] World Bank, *World development report 1980*, Washington, 1980, p. 142-3

[2] U.S. Council on Environmental Quality, *The global 2000 report to the President, 1980,* p. 242

Forest land

Increasing population has accelerated the rate of depletion of vital natural resources in the region. The most obvious example of this is the destruction of tropical forest. Forest land in Thailand, for instance, has dwindled from 51 per cent of total land area in 1963 to 38 per cent in 1973 and just 25 per cent in 1978. This scale of destruction is mainly due to the need for more agricultural land for an increasing rural population and to illegal logging. It is clearly endangering the survival of many species of fauna and flora.



Growing rural populations: a cause of deforestation

The protection of forest requires strong and consistent governmental measures. China and the Republic of Korea are both succeeding in arresting deforestation. China has established 48 million hectares of new forests in the past 25 years. Another effective measure which many countries have taken up is the promulgation of protected areas such as national parks and wildlife reserves.

Sources of energy

In the past decade, 'energy' has become the subject of great concern in countries all over the world. The economic repercussions of rising energy costs are blamed for the stagnation of the economies of developing countries and for aggravating inflation.

The issues of energy and the environment are most readily linked in the mind by the controversial question of the safety of nuclear power plants. Although nuclear power serves as a useful alternative to oil, the issue of safety remains unsettled. Many countries in Asia have, at one time or another, contemplated the construction of nuclear power plants. In many cases, however, protests from environmentalist groups have forestalled such ideas, at least for the time being. In the future, the expected increase in energy demand and the continuing rise in petroleum prices are likely to cause the issue of nuclear power to be raised again.

The search for renewable energy resources will gain in the meantime, particularly for sources which are agriculture-based. In China, millions of bio-gas units have been installed, providing an example of the use of appropriate technology to produce sufficient energy for rural consumption. The production of alcohol from sugar-cane or tapioca, following the lead of Brazil, has received greater attention in many countries with extensive plantations of sugar-cane and cassava. Solar energy must be developed urgently.

Environmental pollution

Environmental pollution results mainly from improper handling of domestic wastes, disposal without treatment of industrial effluents and emissions, and surface run-off from agricultural areas which have received overdoses of fertilizers and pesticides. Pollution affects land use; changes the quality of natural bodies of water, making them unfit for domestic, industrial or agricultural uses; alters the characteristics of the air in any given geographical area; and in general causes impairment to the normal use of natural resources.

The increasing threats to man's welfare and the rising social costs of pollution have compelled governments to draw up new policies, enact legislation and set up institutional and administrative machinery to deal with the problem. Methods now exist to control environmental pollution from domestic and industrial sources. Standards need to be set and factories must comply with them if pollution is to be controlled. More importantly, public awareness and concern for a clean and safe environment, knowledge of the actual and potential threats to the health and well-being of the public posed by uncontrolled pollution, and the realization that there can be economic development without pollution or destruction of the land, water and air of the country: these are vital to the control and prevention of environmental pollution.

Residue utilization

The development of technology for renewable and re-useable resources has emerged as one of the foremost environmental issues. Residues generated from agriculture and associated agro-industry are traditionally available in most developing countries of Asia and the Pacific. For example, one-third of the entire population in the Philippines is dependent on coconut. Recently, the government embarked on a National Coconut Replanting Programme covering a 40-year period for 2.5 million hectares of land which are presently under coconut cultivation and set aside an additional 0.4 million hectares for expansion. This progressive programme will lead to the replanting of 350 million coconut trees. Statistics show that 40 per cent of standing trees are already over 60 years old. The programme clearly verifies the enormous potential of the production of coconut oil, copra, desiccated coconut, building materials from coconut trunks, charcoal and activated carbon from coconut shells, handicrafts from coconut fibre, animal feed from copra cake, and others.[3]

In considering the technology for residue utilization, end-uses like energy, food, construction material, chemicals and fertilizer should be given due attention. Sugar and palm oil industries could set examples in energy consumption of their own generated residues. In the sugar industry, the residue–bagasse–is used as its main fuel source and the industry is almost self-sufficient in energy supply. It is a normal practice to sell the leftover bagasse to nearby paper mills as raw product for pulping. In the palm oil industry, fresh-fruit-bunch fibre, a residue of the milling process, is burnt to generate energy.[4]

Residue utilization not only produces renewable resources, but also contributes towards solving pollution problems. Residues in the form of effluents from agro-industries are normally non-toxic in nature, but their quantum may cause severe pollution to receiving waters. The case of pollution from palm oil mills in Malaysia is an example. This pollution issue has been given top priority by the Malaysian government. Aside from the control of the quality and quantity of effluents, successful applications of residue utilization such as the spraying of diluted effluents on nearby plantations would be economically beneficial to the pollution control programme.

Regarding palm oil effluents, waste load concentration can reach as high as 20,000 parts per million of biological oxygen demand (BOD). Experience from the region indicates the willingness of industry to invest in pollution control in ratio to the profitability of its products: if money is earned, it gets done. Most of the time, government has to play a leading role in providing technical know-how and in initiating technical research on new pollution control technology.

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[3] United Nations Environmental Programme (UNEP). Regional Office for Asia and the Pacific. *UNEP Asia-Pacific report 1980*. Bangkok, January 1981.

[4] *Ibid.*

The stage is now set for further action on technology for renewable and reuseable resources. Developing countries are about to further their programmes for full utilization of vast amounts of agricultural and agro-industrial residues. It is expected that the 1980s will see a progressive collaboration among various research institutes of the region. Demonstration pilot projects on residue utilization could and should be launched. The result of these activities would lead to the development of regional technical capability, and to commercial application of these renewable resources.[5]

Marine environment

The protection of the marine environment is important to the conservation of an inestimable food resource. Lately, offshore petroleum and mineral explorations have been intensified in this region. The impact to the marine environment from oil spills from transportation, offshore exploration, and production activities is of concern to all countries. This issue is trans-boundary in nature requiring close collaboration among neighbouring coastal states sharing the same water bodies. In this region, a good example was set by a tripartite agreement between Indonesia, Malaysia and Singapore which share the Malacca Straits to ensure safety in navigation and the protection and control of oil spills.

Tourism

The tourism boom has hit Asia and the Pacific. Vanuatu, an island country in the South Pacific, has roughly the same number of visitors annually as its population (about 100,000). Singapore, Hong Kong and Thailand receive close to or beyond two million visitors each year contributing significantly to their economic development. In Fiji, tourism is now the second biggest foreign exchange earner next to the traditional sugar industry. The social impact on indigenous cultures and on their social values, however, has not received due attention. The influx of foreigners with their own practices and ways of life affects the social life of recipient developing countries. This is particularly true in Asia and the Pacific where cultures are highly receptive to foreign intrusion. The issue merits careful and intensive study.

The eight major environmental issues introduced so far serve in providing glimpses of the nature and scope of the environmental problems in Asia and the Pacific. These issues are recognized in quite a few countries and have resulted in the setting-up of governmental machineries and organizations to co-ordinate and tackle environmental problems, the degree of success or failure of which varies from country to country. The indication is clear:

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[5] *Ibid.*

unless the countries work hard to stop this environmental degradation, the situation in the region will rapidly become worse.

The role of environmental education

In simple terms, environmental education can be regarded as the process of learning through which participants acquire sufficient knowledge to contribute towards solving environmental problems. Environmental education should cover study and training as well as research and information dissemination. (This article will deal mainly with the third level of education—higher education—as primary, secondary and out-of-school education are covered elsewhere).

Environmental education programmes, in one form or another, are in existence in every country in this region. Since environmental education is still regarded as a relatively new subject, curriculum development and the formulation of instructional materials are given priority. Attention is also given to formal and non-formal training in environmental education of teachers. There are numerous universities and colleges offering environmental courses in Asia and the Pacific. In India alone, more than 40 universities and colleges offer such courses. At least six universities in the Philippines include curricular offerings in environmental sciences and ecology.

There are many places where these graduates are needed in the environmental work of the region. Just a few of the many possible engagements or fields of work for environmental education graduates is given below.

1. Teaching and research
2. Soil and water management
3. Management of national parks and reserves
4. Forest management and wildlife protection
5. Air and water pollution monitoring
6. Advisory services to industries and agriculture
7. Aquaculture and livestock management
8. Environment counselling in planning groups and organizations
9. International organizations
10. Environmental information dissemination
11. Field extension workers in agriculture, forestry or irrigation.

Environmental research

The realization of environmental problems in the last decade has promoted the intensification of research into various aspects of the environment at international and national levels. The Unesco Man-and-the-Biosphere (MAB) Programme, and the natural-sciences-related research supported by the United Nations University and the Ford Foundation, to name just a few, all contribute to a better understanding of ecosystems and the broadening of knowledge concerning the relationship between man and his environment.

At the regional level, programmes such as those of the United Nations Food and Agriculture Organization (FAO) as well as those of Institutes for Tropical Medicine (TROPMED) and Tropical Biology (BIOTROP) under the Southeast Asian Ministers of Education Organization (SEAMEO), have promoted research by scientists on environmental issues. At the national level, higher learning institutions, particularly universities, are conducting research funded mainly by governmental sources on local environmental problems.

Except for research in specialized areas, such as the study of water-borne diseases or industrial waste water treatment systems, the majority of environmental research–which normally deals with studies of natural ecosystems or the induced impact on the natural environment from development activities–are at the preliminary stage. Studies like those on the impact of sedimentation on the coastal marine environment require long-term observation and analyses. The amount of historical data is normally insufficient, hence the need for intensive data-gathering which prolongs the research period. Other studies–such as those on the safety aspect of nuclear power plants–can be rather controversial and do not offer clear-cut solutions. At times, the shortage of experienced scientists in developing countries can pose an obstacle.

The importance of environmental research is indisputable. Without it, intelligent analysis for decision-making cannot be accomplished. Research is important to neutralize the influence from vested interests. Often, due to the absence of technical and scientific evaluations, bias on the part of these vested interests can distort the whole picture and lead to inaction by governments who–for fear of public aversion–may delay the implementation of development projects.

Some countries in the region, such as China, India, Malaysia and the Republic of Korea, possess capable institutional facilities for conducting research which should be utilized to maximum benefit for the region as a whole. The biogas experience in China, the experience of India on water resources modelling, that of Malaysia on palm oil and rubber effluents treatment, and of the Republic of Korea on environmental engineering could contribute to regional scientific communities and the improvement of regional environmental conditions.

Post-graduate integrated environmental education

In recent years, universities have expanded their curricula to offer courses and degree programmes in various aspects of environment. A review of environmental programmes available in universities of this region has indicated a broad spectrum of programmes depending on the fields of study of each university. Generally, these programmes seem to have originated from a natural-science or applied-science base and may be categorized into:

1. Environmental sciences and engineering
2. Natural sciences
3. Environmental management

Rice paddies and forest in the Philippines call for environmental management.

Recently, the idea of introducing post-graduate integrated environmental education programmes with the objective of producing environmentalists with sufficiently broad knowledge to synthesize various dimensions of environmental issues for decision-making has received greater recognition. The response to such an approach is dependent on the needs of each country. In some countries there seems to be a dearth of environmental managers, particularly in the public sector, to ensure overall consideration of the environment in development activities. On the other hand, some countries feel that such broad-based integrationists may often lack a deep understanding of basic scientific knowledge. Such graduates may not find themselves in a position to provide the technical solutions demanded of them.

The strengthening of an integrated environmental education programme for this region can best be achieved through the establishment of a network of existing universities and higher learning institutes. The nature of each programme may vary depending on the strength of the associated institute and the needs of the country. This approach will provide sufficient flexibility to fit the needs of various institutes and countries.

Environment training

Over the years, the United Nations Environment Programme (UNEP) has been promoting training of various professionals. The prime objective of environment training is to improve the knowledge and to increase awareness of environmental issues for both governmental and private sectors, and the public at large. From past experience, training for engineers and development planners has proved to be successful in ensuring the consideration of the environmental factors in association with activities of these professionals.

Most countries in Asia and the Pacific have their own training programmes for various target groups and audiences. It is also common practice for officials from developing countries to attend training programmes offered in the developed countries; many of these, however, are too theoretical and parochial to be suited to the needs of developing countries. Of prime importance is the promotion of more regional and national training activities using local expertise, and emphasizing case studies from the region

Many of the key subjects of environmental training are in a stage of rapid development. The universities in developing countries are in a position to serve as centres of technical knowledge. Universities can respond quickly to the need for organizing short-term interdisciplinary courses. The role of universities in offering environmental training should be further explored and promoted.

Targets for environment training should be redressed to fit the changing needs of developing countries. For example, state or provincial administrators are the responsible authorities at the grass-roots level who carry out day-to-day contact with rural people. This could be the determining factor for the success or failure of an environment programme. The training of these administrators is vital. The other target group which merits additional attention is the mass media professionals who convey environmental information and awareness to the public. Many environmental issues are technical in nature; thus a thorough understanding of the essence of these issues is a necessary precaution against well-intentioned misrepresentation which may confuse the public and produce negative backlash on worthwhile projects.

Environmental information

Since the environment belongs to everyone, participation of the public in environmental programmes should be the goal. Environmental education should play a prominent role in disseminating knowledge and information to the public. In the South Pacific, radio broadcasting is the best medium for disseminating knowledge to rural areas. Poster campaigns on World Environment Day and other significant occasions have also proved successful in drawing public attention to the issues related to environment.

It should be noted that the majority of people in Asia and the Pacific still live subsistently in rural areas. Naturally they are preoccupied with making a living out of the scarce resources available to them. The case of deforestation through forest clearance by landless farmers in restricted areas serves as evidence. Unless they are convinced of other possibilities, these farmers will not be able to afford the luxury of conserving nearby forest lands when they are faced with the need to expand their land for the ever-increasing members in their families. Hence environmental information programmes should be conducted hand-in-hand with development to ensure support and participation of those affected.

Conclusion

The trend of environmental problems in Asia and the Pacific point towards a generally worse environment before it becomes better. Congested urban areas are likely to become centres of environmental decay. At the same time, the increasing population pressure in the rural areas will accelerate the encroachment or irrational use of limited natural resources. Such gloomy pictures are not as yet out of control and many conditions can be corrected as has been evidenced by the success cases cited in this paper. Strong conviction, political will and positive action by governments are the prerequisites to alleviating these problems.

Environmental education including training, research and information dissemination is the indispensable means for both short-term and long-term solutions. Learning from the experience of others through education has proven to be the fastest way to accumulate knowledge—and can offer viable solutions. Educators thus play an important role in safeguarding our environment both in the present and the future. □

Additional select references

1. Australia. National Commission for Unesco. *Directory of regional tertiary environmental courses.* Canberra, Australian Government Publishing Service, 1980.
2. ________, ________. *Regional tertiary environmental education.* Canberra, Australian Government Publishing Service, 1980.
3. Kershaw, W.E., G.R. Francis, and D. Phantumvanit. *Status report on the university-level integrated environmental education programme.* Bangkok, UNEP Regional Office for Asia and the Pacific, May 1978.
4. Suriyakumaran, C. *Statement at the Fourth Regional Conference of Ministers of Education and Those Responsible for Economic Planning in Asia and Oceania.* Colombo, 1978.
5. ________. *Keynote address at the Regional Workshop on Environmental Education in Asia and the Pacific.* Bangkok, Unesco, 1980.

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EFFECTS OF POPULATION GROWTH ON THE ENVIRONMENT

Introduction

The total world population was estimated in mid-1979 at 4,336 million out of which 2,403 million or 55 per cent live in 38 countries or areas of Asia and the Pacific. The rate of population growth in the region was 1.8 per cent, which means the addition of at least 43 million more people per year.[1] Six of the ten most populous countries of the world are in this region; namely, Bangladesh, China, India, Indonesia, Japan, and Pakistan.

These large numbers might cause less concern if availability of natural resources, employment opportunities, food, housing, health, and other necessary things expanded at rates commensurate with population growth. But such is not the case. Unplanned population growth tends to impose severe stress on any nation's agricultural lands, forests, fisheries, grasslands, energy resources, social services and the total environment.

Relationships in an ecosystem

In order to understand the impact of population growth on the environment, it might be useful to consider the natural processes by which balance is maintained between population and the environment in an ecosystem. An ecosystem consists of living (organic) and non-living (inorganic) components which are in balance with each other through a cyclic process. The inorganic matter is replenished by the organic matter through death and decay of the living things which in turn support the life activities in the ecosystem. Any drastic change in either of the components can disrupt the cycle, and thereby destroy the balance in the ecosystem.

Small organisms such as bacteria, amoebae or yeast possess a tremendous capacity for growth. A bacterium dividing every 20 minutes would produce a colony one foot deep over the entire earth in a day and a half. An hour later, the layer of bacteria would be well above our heads. Along the same lines, if the human population continues to grow at the present rate (doubling every 35 years) for about 900 years then there would be over "sixty million

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[1] United Nations. Economic and Social Council for Asia and the Pacific. Population Division. *1979 Demographic estimates for Asian and Pacific countries or areas.* 1 p.

This article has been contributed by the Population Education Programme Service, Unesco, Bangkok.

billion people. This is about 100 persons for each square yard of the earth's surface—land and sea.[2]

These are theoretical rates of growth, not actual ones. The ability of the population to grow is called the *biotic potential.* Different animals have different biotic potentials. For example, man has a lower biotic potential than the amoeba or bacterium but a higher potential than the elephant or tiger.

Under natural conditions no animal or plant can grow to its fullest potential as it is checked by what is called *environmental resistance.* This environmental resistance may include both the physical environment and the cultural one. Environmental resistance exists when one or more factors of the environment become limiting, and decrease the birth rate or increase the death rate or both. The limit of the biotic potential of a population imposed by environmental resistance under a given set of conditions is called the *carrying capacity* of the environment. The relationship between the biotic potential, population growth and environmental resistance in the case of animals and plants forms a characteristic sigmoid or 'S'-shaped or logistic curve as indicated in Figure 1 overleaf.

Effects of human population growth on the environment

There are people who believe that the environmental problem is primarily a problem of the rich and more affluent countries. The same kind of

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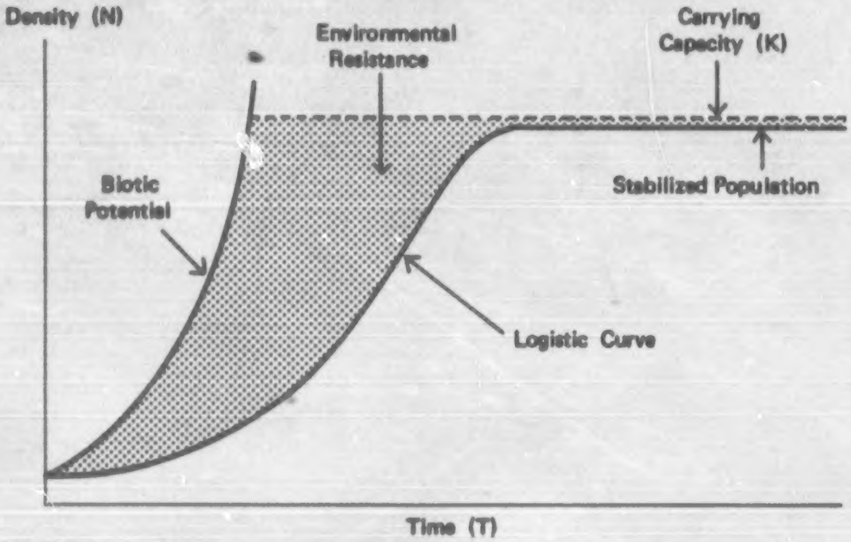
2. Paul R. Ehrlich, *The population bomb*, New York, Ballantine Books, 1968. p. 3

Figure 1. Theoretical relationship between biotic potential, environmental resistance and logistic curve [3]



where D = Death rate,

Biotic Potential $= \frac{DN}{DT} = TN$

Environmental Resistance $= 1 - \frac{K-N}{K}$

Logistic Curve $= \frac{DN}{DT} = TN - \frac{K-N}{K}$

argument was advanced at the Stockholm Conference in 1972. If we accept this argument then the problem of environmental pollution should not be a matter of concern for the developing countries. But the fact is that the developing countries are also suffering from environmental deterioration and are, most probably, heading for more pollution than the developed countries with their higher rates of population growth and efforts for industrialization.

At present, however, the problem of environmental deterioration in the developing countries is due less to industrialization than to their higher rate of population increase, poverty and lack of development. The set of environmental problems arising out of population increase and poverty has been summed up by Gamani Corea of Sri Lanka as follows:

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3. Sharma, R.C. *Population, resources and environment.* Paper presented at the Unesco Group Training Course in Population Education, Bangkok, 14 July–15 August 1975. 10 p. mimeo.

> Ours are the problems of poor societies: the problems of bad water, poor housing, disease and sickness, lack of sanitation and sewage facilities, inadequacy of nutrition and vulnerability to natural disasters. These problems have not arisen from an excessive degree of development; rather, they reflect the inadequacy of development. Thus, while the rich countries may look upon development as the cause of environmental destruction, the poor countries cannot but look upon development as the cure, as the means of remedying basic environmental problems. In this sense, therefore, the concern with environment in the developing world is but an aspect of the commitment to development. There is no inherent antagonism, no inherent conflict between the goals of environment and the goals of development. They are but facets of the same problem.[4]

Although many people attribute environmental pollution to affluence and industrialization, it can be directly as well as indirectly linked to population increase.

1. **Direct effects.** Other things being equal, the greater the population, the more significant are the changes brought about in the environment. More people make more demands on food, energy, housing, clothing and transportation, all of which lead to environmental pollution. Poor quality or insufficiency of food supply, sanitation, water supply, housing, employment, and health and other services are common problems in countries with high rates of population increase. The problems of domestic sewage and solid waste disposal are directly related to the number of people. As the number of people increases, the space per person for waste disposal decreases. Thus small mountains of dumped waste are common sites in almost any urban area.

Water pollution resulting from sewage and industrial waste provides a clear example of the effect of unplanned population growth on the environment. The carrying and the decomposing capacities of the rivers are strained to their maximum by increases in urban population and by the development of industrial complexes leading to the disturbance of river ecosystems. For example, if just a few people per square kilometre live along a large river and their sewage is dumped directly into the river then natural purification will occur. But if the population increases, the decomposing ability of the river will be surpassed and either the outgoing sewage or the incoming water—or both—will have to be treated if river water is to be used for drinking or for irrigation purposes.

As an extreme example, in India, 13 million people are added each year to the country's population. For meeting the basic needs of these additional

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[4] United Nations. *Report and selected papers of the Regional Seminar on Ecological Implications of Rural and Urban Population Growth,* Bangkok, ECAFE, 25 August-3 September 1971. (Asia Population Series No. 10). iv, 192 p.

people one needs to provide each year, about 12,545,300 additional quintals of food (a quintal in India is 100 kilogrammes), 2,509,000 additional houses, 126,500 additional schools, 372,500 additional teachers, 188,774,000 extra metres of cloth and 4,000,000 additional jobs.[5] This has not only an impeding effect on social and economic development activities in India but also an adverse effect on the total environment. The cases of other developing countries which have high rates of population growth are comparable.

The pollution of the environment is a function of density of population (DP) and per capita income. The *index of pollution potential* (IPP) can be calculated by means of the following formula:

$$IPP = \sqrt{\frac{DP^2 \times PI}{k}}$$

Where DP is the density of population
PI is the per capita income, and
k is the constant = 100

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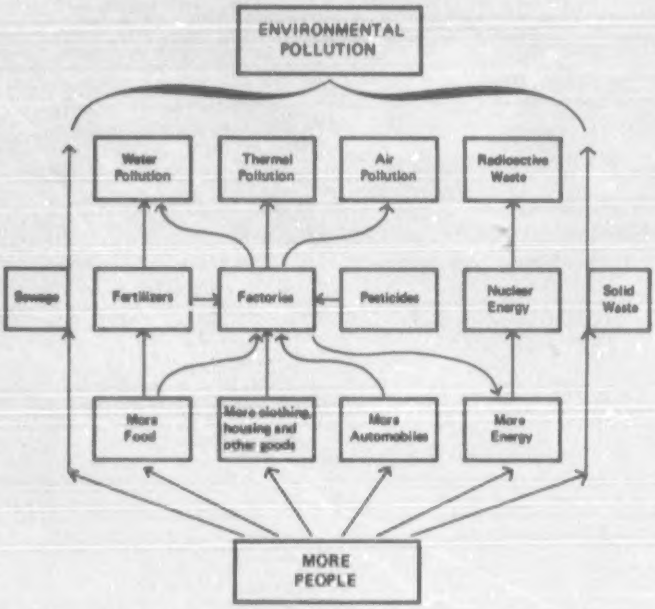
[5] India. Ministry of Health and Family Planning. Department of Family Planning. *Population problems of India.* New Delhi, 1967.

In 1970 the IPP of Japan was about 92.1, or about seven times the IPP of the United States which was 13.3. The IPP of Hong Kong was almost eight times and that of Singapore nine times the IPP of Japan. If the current methods of production and development of Japan are adopted by countries in Asia, then by the year 2000 these countries will be able to achieve the current Japanese standard of living. Then, all the countries in the region except perhaps Australia, Iran, the Lao People's Republic, Mongolia, New Zealand and Papua New Guinea will have an IPP greater than 13.3. Countries which will have a *greater* IPP than the current IPP of Japan will include Sri Lanka, China, Hong Kong, India, Pakistan, Philippines, the Republic of Korea, and Singapore.[6]

Figure 2 gives an illustration of the relationship between increasing population and environmental deterioration. More people need more food, energy, housing, clothing, transport, and all of this leads to environmental pollution.

Figure 2. The relationship between population growth and environmental pollution


ENVIRONMENTAL POLLUTION
Water Pollution
Thermal Pollution
Air Pollution
Radioactive Waste
Sewage
Fertilizers
Factories
Pesticides
Nuclear Energy
Solid Waste
More Food
More clothing, housing and other goods
More Automobiles
More Energy
MORE PEOPLE

Source: R.C. Sharma. *Population trends, resources and environment: handbook on population education.* Delhi, Dhanpat Rai & Sons, 1975. p. 249

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[6] United Nations Economic Commission for Asia and the Far East. *Asian population series* no. 10. Bangkok, 1971. p. 36.

2. Indirect effects. Not only is the population of the developing nations growing at very high rate but more and more people are aspiring for a 'better quality of life' which, to many people, means the possession of more material goods and provision of modern conveniences, hence increased consumption. Rapid consumption of natural resources and waste disposal by the increasing number of people will place an ever greater stress on the environment.

Man has the ability of manipulating the environment and changing it to suit his needs. Through a cumulative cultural advancement and new technological discoveries we have been changing the environment to meet our needs or desires; in the process, we have already done considerable damage to a number of ecological systems. The effects of our intervention in the natural system are becoming more and more evident and the stage has now been reached where we are getting more concerned about the deteriorating environment because it is affecting our lives.

Simply put, if because of human population increase and our increased interference in the ecological processes, the environment continues to deteriorate at the present rate then we shall face the challenge of our very existence in the near future. The laws of nature which regulate the increase of animal populations will ultimately apply to man as well and this would mean starvation, disease and death on a massive scale. Because the cause of environmental deterioration is human in nature, we must find a human solution to the environmental problem by curbing our population growth rates and changing our values and way of life in order to cause minimum disruption in the ecosystems.

In their desire to achieve a higher level of industrialization so as to raise the material standard of living, developing countries may be tempted to regard ecological problems as having relevance only for the developed countries. The developing countries of Asia and the Pacific should benefit from the experience of Japan which has had unprecedented rapid economic growth in recent years and which now faces severe problems of environmental disruption and degradation.

Conclusion

The developing countries with their high rates of population growth are potentially destined to suffer severe environmental problems. At the present moment, since the main problems of the developing countries are to feed their people and to eradicate poverty, their developmental patterns have to be different from those of industrialized societies. The type of development that is going to solve the problem initially must have its focus on rural development, with emphasis on land reform, on producing enough food, on community agriculture and on labour-intensive technology. Countries should adopt national strategies for technological and economic growth which will help create minimum ecological, socio-cultural and environmental disruptions. As population growth has direct as well as indirect effects on the quality of the environment, a reduction in the rate of population growth should form one of the basic strategies for development and improvement of the environment. A multi-pronged approach, *depending greatly on the education of children, youth and adults,* should be resorted to in order to solve the problems of population increase, poverty and environmental pollution. □

Select references

Ehrlich, Paul R., Ann H. Ehrlich and John P. Holdren. *Ecoscience: population, resources, environment.* San Francisco, Calif., W.H. Freeman and Co., 1977. xv, 1051 p.

Goldsmith, Edward, ed. *"The ecologist", a blue print for survival II* (January 1972).

Meadows, Donella H. [et al.] *The limits to growth—a report of the club of Rome's project on the predicament of mankind.* New York, Universe Books, 1972. 205 p.

Revelle, Roger [et al.] eds. *The survival equation: man, resources and his environment.* Boston, Mass., Houghton Mifflin Co., 1971. x, 508 p.

Sharma, R.C. *Population trends, resources and environment: handbook on population education.* Delhi, Dhanpat Rai and Sons, 1975. 296 p.

United Nations. *Report and selected papers of the Regional Seminar on Ecological Implications of Rural and Urban Population Growth,* Bangkok, ECAFE, 25 August-3 September 1971. (Asia Population Series No. 10). iv, 192 p.

United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972. *Final report.* New York, United Nations, 1973. 77 p.

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A NEW ROLE FOR SCIENCE IN A CORE OF ENVIRONMENTAL EDUCATION

by Peter J. Fensham

Introduction

Science is a very well-accepted part of the whole range of subjects for both primary and secondary education. We may not always teach it as well or as much as we would wish. We may not have equipment, or apparatus or chemicals, and so many of its fascinating experiments are hard to make part of the school experience. Since 1970 or so, however, most countries in the region do state that science should be part of the whole curriculum for all children.[1]

We can think of a total curriculum being made up of a lot of different subjects and often in practice this is how schooling works out. There is a time-table for the day and week and the pupils study mathematics for one period, then language, then history, then science, then physical education, and so-on until each day's allotment of periods is gone. Each subject has its own textbook and its own special terms and symbols. At the end of the mathematics period its books are closed, and it is as if the pupils and teacher (a different one for each subject usually in secondary school) step into a different world of knowledge as they open the books for language and start to practise its specialities. We can describe this very common approach to the curriculum as *atomistic* because it has discrete and separate parts, the sum of which equals the whole.

It is possible, however, to approach the idea of the total curriculum in another way. If instead of thinking–what subjects are available or need to be learnt?, we ask–what basic skills do we want our pupils to acquire?, part of the answer might be that they should be able (1) to observe carefully, (2) to become competent in the four basic operations of arithmetic, (3) to read with some comprehension, (4) to report accurately on paper and orally, and others. We will now see that each of these skills will be contributed to by a number of different subjects. For example, reading is part of most subjects, and addition and subtraction come into arithmetic, geography, science, health and just about everything else.

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[1] Unesco Regional Meeting on the Trends and Problems in Science and Technology Education in Asia, Singapore, 20–26 July 1976. *Trends and problems in science and technology education in Asia; report.* Bangkok, Unesco, 1976. p. 4

Another alternative is to ask—what topics should all pupils have studied before they leave school? The answer to this question will no doubt vary from country to country, but let us suppose that it includes Food, Birds, and Time. Food can be treated historically, geographically, biologically, and as part of health and consumer education. Birds have often inspired poets, their characteristics fall properly into biology, and their peculiar powers of flight involve physics and mathematics. Time is a major concept in history and earth science. It is an important variable in physics and chemistry, and rate is a well-defined mathematical concept.

Pupils of grade IV in the Philippines doing an experiment in Elementary Science: extracting chlorophyll from plant leaves.

In both alternatives we have continued to recognize the subject areas of knowledge but not as the primary building blocks of the curriculum. Skills or processes were these building blocks in one case, and topics or themes in another. In both cases the subjects can be used to bring about the learning of these trans-subject fundamentals for schooling. In contrast to the atomistic view these alternatives are described as *holistic*. Some approaches to education of the holistic type almost lose sight of the separate subjects, but since this article is about science education (a subject) and environmental education, they will not be described here.

Environmental education

Any of the recent definitions of environmental education place it beyond one of the traditional subjects. The big topic areas that are usually referred to are Ecology, Energy, Population, Food and Resources, each of which can involve the knowledge and skills of a number of school subjects. It is the crises that human society faces in these areas that constitute the environmental situation recognized by the United Nations at the Stockholm Conference of 1972. Environmental education, as conceived since (see the Unesco-UNEP Programme and many other sources), is to be an educational contribution to the resolution of these problems. In terms of both its required skills and its great topics, it transcends the single subjects, although each one, and particularly science, has a contribution to make.

Most school systems have curricula that are more *atomistically* oriented in subjects than they are in one of the *holistic* ways. It is thus important to think how to blend the two if we are concerned about achieving the goals of environmental education. One way that may help is to think of the curriculum for general education being made up of a *core* (an essential part for all students) and electives (optional parts taken only because they are required by or interest sectional groups of students). Let us suppose then that we can agree (as many countries apparently did in 1977 at the Tbilisi Intergovernmental Conference on Environmental Education) that environmental education forms a part of the core curriculum.

Atomistic approaches to environmental education

On the first view—the atomistic one—there are two common practices. The first is to create a new unit that is charged with contributing the environmental component to the core. Environmental Studies or Environmental Science is now a core subject in this way in the schools of a number of countries at one or more of the levels of compulsory schooling.

Since the emergence of a new subject always squeezes the existing subjects that are already competing for a share of the core time, these specifically environmental components are often restricted to an hour or a few hours per week in primary schools or to just one year of the compulsory secondary school years. Environmental education can also appear in this separate component approach but as less than a subject. For example it is not uncommon to find environmental education being stressed in a field trip, a school camp, a day seminar, or a project-for-a-week, when the regular subject curriculum is suspended and this brief and special environmental component finds its place in the total school programme.

Even more common, within this atomistic approach to a core curriculum, is to identify this component with one or more of the existing building blocks. Geography and Biology (hence Science) have been by far the commonest to be given this responsibility, although occasionally Social Studies has also this role. Indeed, both geographers and biological scientists have tended to argue their peculiarly appropriate identity with the environment as one of the grounds in the 1970s for their need of an appreciable share of the core time.

While these atomistic approaches can include environmental education in a core curriculum, they are widely seen as less than ideal by environmental educators. At meeting after meeting through the last decade, these educators have argued for the more holistic approach as the ideal. This appears to have three main bases. The first is the philosophical one that perceives environmental situations as holistic phenomena and hence wishes to see any education for these situations as being also so-based. This does not deny the acknowledgement of components, as in a systems approach. It does, however, see their contributions as interactive and derived from the overriding goals. In this view the whole is greater than the sum of its parts.

The second objection to the atomistic approach to environmental education in the core curriculum is the precarious and low status it has there as a component subject compared with the other components, backed as they tend to be by long-established disciplines in higher education.

Thirdly, for any single unit (or single teacher) to provide the integrative 'cement' that is to embrace many other knowledge components is an overwhelming task. Finally, the identification of environmental education with Geography or Biology or other subject inevitably reduces it to those aspects (important though they are) that lie within the competence of these kinds of teacher. Thus, moral, political, economic, quantitative, technological and aesthetic aspects of environmental situations are neglected or handled in very superficial ways. The insulation of teacher responsibility in the atomistic approach tends to ensure that the deficiencies will not be made good by other subject teachers. In the 'identification' approach, environmental education often also tends to become submerged as good geography or biology teaching and within those subjects loses the cutting edge that many of its proponents wish for it.

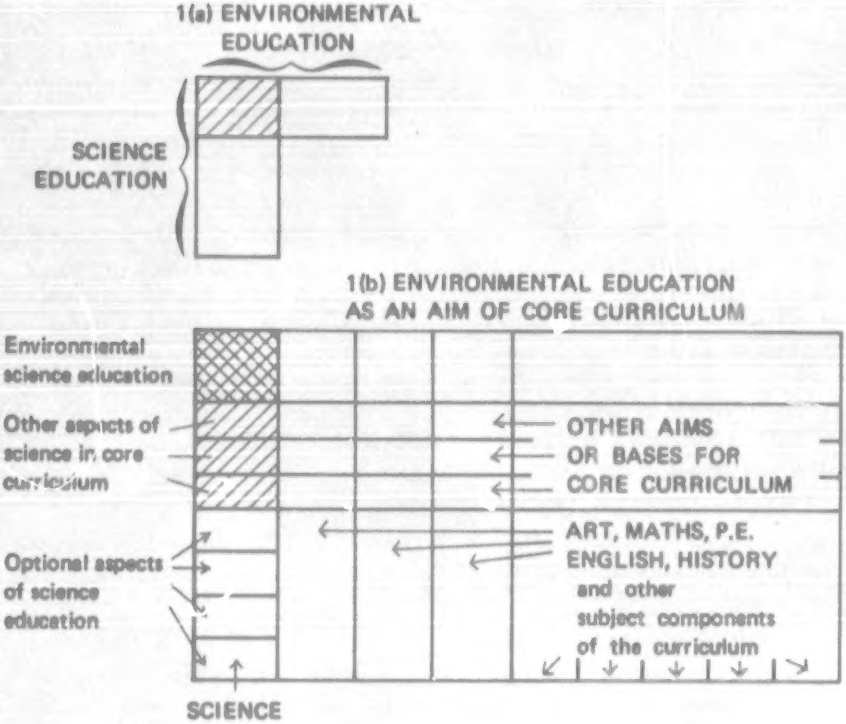
The holistic approach

In what follows, a holistic approach to environmental education is presented. It sets out to define the contribution that a subject like science has to make and to provide criteria that will assist science teachers to know when they are making it.

Relating parts to a whole. A set of agreed characteristics for environmental education can be listed from the documents of the Tbilisi Conference (1977). These may not be complete or the only descriptors, but they are a set of criteria which can be used to identify when, and in what ways, science education (as part of the curriculum) is contributing to environmental education. The task, using these criteria, is to delineate the contribution of science education to an overall curriculum emphasis on the environment. At the same time, it should liberate science instructors from any sense that perhaps everything in their science classes is supposed to have this environmental character. Science has a number of contributions in its own right to make in schooling and these should become clarified if the process is helpful. Figure 1(a) illustrates the suggested approach for science education and Figure 1(b) shows the potential outcome of the procedure when it is extended to all the subject components of a school programme.

Figure 1. The overlap model for the contributions of the subject components of the curriculum to its core and options:

(a) science education and environmental education
(b) a core with several aspects including environmental and the variety of subject components.


1(a) ENVIRONMENTAL EDUCATION
SCIENCE EDUCATION
1(b) ENVIRONMENTAL EDUCATION AS AN AIM OF CORE CURRICULUM
Environmental science education
Other aspects of science in core curriculum
Optional aspects of science education
OTHER AIMS OR BASES FOR CORE CURRICULUM
ART, MATHS, P.E. ENGLISH, HISTORY and other subject components of the curriculum
SCIENCE

The doubly-marked segments for each subject in the Figures together contribute the overall curriculum core for environmental education. The areas of non-overlap represent curriculum content in these subjects that exists for other valid educational reasons.

The set of characteristics for environmental education (E.E.) can be stated as follows:

1. E.E. is oriented towards a problem.
2. E.E. is concerned with realistic situations.
3. E.E. aims to elaborate the alternatives that exist for situations and the skill of choosing between them.
4. E.E. includes action as an integral component.
5. E.E. uses the real environment of the school and its surroundings as a context.
6. E.E. involves the clarification of values.
7. E.E. aims to increase the ability that students have to contribute to improving their own environmental situations.

Each of these can be found among the lists of objectives, policy statements and other descriptions of environmental education that the international programme has brought together or developed. They are not intended to be exhaustive but they are sufficient to indicate a direction of definition that, by the time of the Tbilisi Conference, enabled environmental educators to differentiate between *education in the environment, education about the environment* and *education for the environment.* The set of characteristics above relate to the *last* of these three. Educational programmes falling in the *'in'* and *'about'* categories may serve perfectly valid educational aims but these should not now be confused with environmental education as it is defined by the above characteristics.

Thus, a geography or history or mathematics or science lesson may occur *in* an environmental setting outside of the school, but this need only involve No. 5 of the characteristics above. Similarly a biology course of study such as Australia's Web of Life, some parts of Britain's Nuffield Course or of the BSCS in the United States and elsewhere, can have a strong ecological emphasis (and hence be *education about the environment*) without having the more distinctive characteristics 1 + 2 in combination, 3, 4, 6 and 7. These curricula may be good biological education but they are not environmental education in the present sense. Thus, by clearly distinguishing between the core of curriculum of environmental education and the other grounds for teaching biology as part of the total curriculum a teacher or curriculum planner may avoid the possible confusion mentioned above that environmental education is just 'good' biology or geography and vice versa.

Relating characteristics to subject content

The next step in devising the environmental core curriculum is to see to what extent the individual components of the school programme can contribute to these characteristics that now have the primacy of educational aim that a core curriculum implies. In the case of science, we now look for examples in science subjects which fit the overlap requirement of Figure 1(a). It is these aspects of science lessons that will now take a priority place in the teaching of science if environmental education has been accorded the status of core curriculum. Other aspects of science teaching and learning will also no doubt qualify for a place in any other educational purposes (such as basic skills education) that are also seen as core within the curriculum. This is also indicated in Figure 1(b).

Finally, there will be much of science education that does not (nor should it) have any of the characteristics required by these core parts of the curriculum. These then become—within the strengths of the teachers and the needs of particular sub-groups of learners—the science offerings in the elective or optional part of the curriculum. For example, it would probably follow that much of the highly conceptual and theoretical knowledge included in most school chemistry courses would now become part of this optional section of the total curriculum. In fact, the serious study of chemistry in most countries of the region is optional in the sense that it is restricted to a small minority of secondary students who may wish to prepare themselves for chemistry-based courses in higher education or whose intrinsic interests lie in such knowledge. This situation—alas—often precludes from the remaining majority any worthwhile contribution from chemistry to their education. In the atomistic and monolithic view of these science subjects it is too easy to fall into this all-or-nothing situation. The present article and its proposal is a plea that the sciences can make real contributions to these two different educational purposes.

Describing the part in the whole

Education in a science subject (or in integrated science) is concerned with (a) the *established knowledge of the particular science(s)*, (b) with *its special intellectual skills* and *its practical techniques* and (c) *the attitudes that this field of human endeavour represents.* That is, science education is both knowledge and its growth and use. If we accept this general description of the scope of science education then we are in a position to proceed with our task of describing the overlap area of Figure 1(a).

Characteristics 1 plus 2. Most of the environmental situations that are now recognized as key problem areas have aspects that involve scientific knowledge. Quite often they are resultant from some type of technological application. The many forms of pollution (such as air, wate , noise or land), are obvious problems that involve scientific knowledge and skills. In a number of countries there are curriculum materials for schools that cover some of these pollution topics; e.g. Fisher (1975), I.A.C. (1978), and a new text published in China edited by Liu and Chen (1981). The consumption—and hence destruction—of limited natural resources are other obvious topics to which the science of the core curriculum has much to contribute. *Which fuel for my kitchen?* is the name of a forthcoming Unesco module that is being developed by the Asian Centre of Educational Innovation for Development (APEID) for use in primary schools in Asian countries where this problem has acute reality for many of the population. Sooner than many people expected it is now a key problem in the more developed societies.

These industrialized countries are already confronted by the problem of recognizing the efficiency with which various technologies consume material and energy resources. The Australian curriculum materials of *Man and the physical world,* and Physical Science Course (Western Australia), with their treatments of the relative efficiency of different sorts of engines are an encouraging start in enabling science teachers to include the man/technology aspects of this problem area into school science.

Other obvious problems for science education to include are (1) food and population issues and (2) the destruction or preservation of natural species and of man-made features of a national or international heritage. Curriculum materials that really emphasize the science aspects of these problems and their solutions are not yet common although a start has been made in a number of places through booklets or slide kits that present a case study of particular situations. Some of the materials in Thailand's Physical Science course are a further example. As yet most of this curriculum material is pitched at the level of higher secondary school beyond the mandatory school-leaving age. We need more material for use by younger children where all pupils may benefit; some APEID materials and some from Israel could be helpful examples for others to follow.

The second characteristic of 'reality' has two important consequences for curriculum planning. The first relates to the learner, the second to the content to be learned. An environmental problem may be real enough in many senses but still not have a reality for particular learners in other situations. The particularities of industrial pollution are very real for the inhabitants of many metropolitan centres, but they are remote or 'unreal' situations for students in rural or less-industrialized settings. The noise pollution of a highway system or an airport has a reality for people living close to it that is different from that for others in more distant suburbs.* Curriculum designers need to be aware of this 'psychological' sense of reality in choosing their problems for science study and to attempt to bridge the 'unreality' gaps when they wish to include more remote environmental problems.

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* In more than one developing country, however, the noise pollution of electronically-amplified sound at frequent commercial fairs, outdoor film showings late at night and truck-borne advertising—as well as the roar of the lorries, trucks and busses themselves—now reaches into hidden hamlets throughout the countryside. *Ed.*

The content sense of reality stems from the fact that the science aspects of many environmental problems belong to the knowledge and skills of several science disciplines. Thus a study of noise pollution involves physics and physiology, and the use of fossil fuels for harnessed work or heat may involve chemistry, physics, engineering, biology and earth science. If science education in school is organized in tight, isolated disciplinary subjects, only a limited range of problems or a limited perspective on them can be provided. A more integrated approach to science teaching itself more easily accommodates the multiple sciences involved.

Characteristic 3. The range of alternatives that exist for many environmental situations can be directly related to the manipulation of their determining variables. Science, with its very strong dependence on the recognition and manipulation of variables, is the best subject area in the curriculum to provide learners with this part of their environmental education. Alternative uses for the same land are commonplace topics for Applied Biology and Agricultural Science. Chemists and physicists are constantly united in the search for new uses of materials and for new materials having the same use. The increasing use of aluminium to replace copper in electrical wire is an example of science's world of alternatives.

Because of an over-concentration on the pure knowledge and intellectual processes of science in curricula for science education in the last two decades, these 'alternative' aspects of Science have been largely ignored in science education for schools. There are, however, signs that the application of science and the basis of technology are now beginning to reappear in materials for schools. *Working with Science,* a new British project, is an interesting example and the appearance of Materials units in Physical Science courses is also a chance to emphasize alternatives.

The second half of characteristic 3 is one to which science education has less to contribute directly. Like 6, it needs to draw on other subject areas like History, Social Science and Moral Education. However, without a clear understanding of the scientific aspects of the alternatives, consideration of the mechanisms of choice or the clarification of values is likely to be trivial or artificial. A choice between coal and uranium as fuel, between wood and aluminium as material or between vegetable and animal protein is meaningless without some understanding of the scientific properties of these alternatives, and of mankind's capacity to control the consequences of such a choice.

There is much to be done by science educators in developing curriculum materials so that their subjects can contribute these vital aspects of science education. Malcolm (1979) has provided a vital comparative discussion of how the 'IPN' materials from Germany deal with the environmental effects of nuclear energy.

Characteristic 4. Science education in itself seems to provide two natural contributions to this aspect of environmental education. Practical work has, with a few ups and downs, been generally accepted as part of science education in schools. Many countries have invested very large sums of money in school laboratories, equipment and support staff. Practical work is thus a part of science education in a way that it is not so naturally part of other subjects of the curriculum. If the science teacher chooses topics for study with the other environmental characteristics in mind, it is not difficult to associate action, in the form of practical work, with them. There is now considerable evidence, however, that practical work by students needs to be carefully directed and explicitly related to the objectives of the entire science curriculum, if it is not to lose its significance for the cognitive development of the learner.

Practical work in the forest, Monash University, Australia

Much of the confusion about practical work in science education stems from its vague character in many modern curricula. The environmental characteristics help us to decide what sorts of practical work need to be emphasized. Students should be given practical exercises which place them in control of the variables of real problems, and in such a position that they actually experience the consequences of the control they exercise. The Patterns material for Britain's Integrated Science Project has some experiments on noise of this type, and some chemical counterparts exist in the corrosion experiments in the Griffin Technical Series. Many more traditional science courses include a number of activities that can, with suitable teacher direction, provide these environmental skill experiences for students in science classrooms.

The second natural way for science education to have this characteristic is in the use of real situations outside school. Students can be involved in a great variety of action programmes that apply scientific knowledge to the environment of the school—such as planting trees, school food gardens, reducing noise, glare or heat, conserving energy and reducing corrosion. If science teachers can co-operate with the 'science-based' individuals in the locality of the school the opportunities in this sort of education for real environmental action will increase enormously. City engineers, health inspectors, local factory staff, and sewage and communication engineers are just some of the people who are willing to assist science teachers in this way.

Characteristics 5 and 6. Environmental education in several countries has been based on what is known as a concentric curricular plan. In the early years of primary schooling there is a concentration on the environments most familiar to the learner. Thus the environments of the home and the classroom are the contexts from which the content and experience of learning is drawn. As schooling proceeds, the environment widens to take in the school, community, city, countryside, state and world.

Science teachers can contribute to characteristics 5 and 6 if they are prepared to seek from their students the details of their home, family, leisure and work environments. Many of these will turn out to have scientific and technological aspects that are present but certainly not mastered by their students (or their families). For example, it is a salutary exercise to try to get senior chemistry students to classify household liquids according to whether they will freeze or not in a household refrigerator. This is a lesson learnt experimentally in some primary science curricula by very young children, but senior students with their stress on knowledge about pure (unrealistic) substances generally lack such familiarity.

The use of energy and *its control* in the home or school involves much scientific knowledge as well as skills that are easy to design into curriculum materials if we can convince science teachers that these are respectable aspects of science. Secondary students in most countries show a widespread interest in the technological reproduction of musical sound. Many have a similar interest in the applications of the internal combustion engine and related frictional problems. Others struggle with problems such as the design of surf-boards, skate-boards, electronic equipment and cosmetics and the maintenance and presentation of a variety of fabrics. Few of these have yet found their way, as topics or problems to solve or skills to master, into the

Environmental education at the beach, Monash University

curricula of school science. There is no shortage of possibilities for the educational objective of the science lesson to add to the knowledge the learner has in his or her environment.

Certainly we have only the beginnings of materials for this type of science education, but a bigger problem is probably that most science teachers have only learnt scientists' knowledge and not the skills and techniques of the applied scientist or the inventive technician. If the teachers' own learning of science has not enhanced their own mastery in their environments, it is not surprising that they have not developed curricula with these emphases. A curriculum that has environmental education as its core will perhaps begin to modify this situation by establishing in a clear way that science education is the best and perhaps the only source in schooling for this type of enhanced mastery.

Summary

Enough examples have now been given to establish that this overlap approach can be used to define content and objectives for science education that contributes to this type of environmental education. If this is accepted as a core of the total curriculum then these aspects of science education have a priority over other aspects for the majority of students.

The novelty of the approach compared with traditional approaches to science curricula or to an atomistic approach to core curricula needs to be fully recognized. It allows the general characteristics of the core itself to define the content of science education. All the other approaches define science education's content from within science or, more accurately, from within the community of professional scientists. This is a radical change in the basic of knowledge and learning. Science educators as a specialist group wield tremendous power in developing curricula. *The environmental crises all societies now face are sufficient grounds, however, for science educators to relinquish their control over curricula and accept a more demanding role as co-developers of a core curriculum dedicated to meeting this environmental challenge.*

Science, as part of an environmental core for school education, will be more concerned with solving problems and with phenomena real to the learner and to his or her society in a wide sense, more aimed at the acquisition of skills and more about the control of variables, than are almost all existing science curricula.

Science-based real problems and the skills needed for their solution are emphasized in science education that is contributing to a core curriculum based on environmental education. This can be an opportunity for well-defined cognitive and psycho-motor learning, both of which will also have their own motivation for the learner. This is a powerful alternative for learners compared with science education as we have known it. It also offers an exciting challenge for science teachers in the next decade as environmental issues inevitably become more visible outside the school. □

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THAILAND'S 'LIFE EXPERIENCE' PROGRAMME: ENVIRONMENTAL EDUCATION FOR PRIMARY SCHOOLS

by Vanli Prasarttong-Osoth

Aims of the primary education curriculum

Thailand underwent a major change in its primary education curriculum in 1978 (B.E. 2521). The change, which involved the whole six years of compulsory education (*Pratom* 1-6), affected not only the subject matter but also the teaching process. The three major goals underlying the new primary curriculum are the following:

1. Primary education is to be regarded as education for all people. Every child has a right to receive and is entitled to benefit from primary education regardless of his family status or occupation, or the location of his home.
2. Primary education is meant to be education for daily life. All knowledge and experience gained at this level of education will be useful in the daily life of all learners.
3. Primary education will contribute towards national unity with regional variations. It will serve as a tool for creating national unity in such areas as language, economics, politics and governmental system. Every member of the nation should have the same background and have a common understanding of the administrative system; regions are allowed certain variations relevant to their local problems and needs, however. Such variations can include occupations, cultural traditions, arts and crafts. Each region can develop additional content and teaching materials which may differ from others but will be relevant to its own everyday life.

Areas of experience in the curriculum

In the past, the primary school curriculum was designed around subject areas such as Thai Language, Mathematics, Natural Science and Social Studies, but the new primary education curriculum of B.E. 2521 adopts a completely different approach. It takes the learner as its focus, and is arranged into four areas of the child's experience as follows:

Area 1–Basic Skills. These are Thai Language and Mathematics. This area represents the key subjects which enable the learners to gain more knowledge.

Area 2–Life Experience. This emphasizes the process of solving social problems. The selected content concerns problems and issues such as health, population, politics, government, society, religion, culture, economics, technology, natural environment and communication.

Area 3–Character Education. This deals with experiences necessary for the development of good character. It includes moral education, art, music and rhythmic movement,and physical education.

Area 4–Work Education. This emphasizes basic practical work experiences. It covers household work, handicrafts, wood-working, agriculture and optional topics relevant to local situations and needs.

Preferred teaching approaches

It has been stated that the new curriculum requires new teaching approaches. The textbook-oriented approach with emphasis on the ability to recall facts and information as taught by teachers is replaced by a practical approach with emphasis on the ability to use facts and information in solving problems which are closely related to the learners' daily life. Teachers should assume the role of helpers and encourage pupils to learn from various sources, such as reading material, experimentation and interaction with people in their surroundings, rather than 'spoon-feeding' them with information from textbooks. Group work should also be undertaken so that students will be able to work with their peers and be able to adapt themselves to their social surroundings.

Although the curriculum is organized into four areas of experience, teachers are encouraged to integrate and correlate the content of the four areas whenever possible. *The new curriculum adopts Area 2, Life Experience, as the centre for integrated activities.* Example: Under the topic of accidents and safety in Life Experience, grade III, one of the sub-topics is accidents while travelling. The pupils, in solving this problem, have to make use of experiences from other areas, as follows:

- The ability to read signs and understand their meaning (Area 1–Basic Skills);
- Knowing the danger of road accidents and how to take care of oneself when crossing the street, walking on the pavement, boarding a bus or riding a bicycle on the road (Area 2–Life Experience); and
- Being concerned for the safety of oneself and others; being considerate and trying to help others; being physically strong enough to take care of oneself and help others (Area 3–Character Education).

Expected outcome of the Life Experience Programme

What the new curriculum expects pupils to have achieved after completing the six years of compulsory education can be summed up in the following aims:

1. Qualities to be emphasized include unselfishness, diligence, perserverance, honesty, sportmanship, self-confidence and self-discipline;
2. Basic knowledge and skills necessary for life such as knowledge and understanding about oneself, one's community, one's environment; how to read, write and calculate; how to behave within the law and conform to social as well as cultural practices; how to work with others, how to manage one's spending effectively and economically;
3. Qualities for a peaceful life such as ability to adapt oneself to the environment; ability to control oneself; ability to apply religious teaching in daily life; ability to work for a living and lead a peaceful life in one's own locality; and
4. Qualities for good citizenship such as recognizing and behaving properly toward others, society and the nation.

These general aims are translated by the primary education curriculum objectives for the Life Experience Programme as follows:

1. To develop basic understanding of and exhibit proper behaviour toward physical and mental health at individual and community levels;
2. To develop basic knowledge and skills necessary for survival;
3. *To adapt to a changing environment and to apply science and technology in daily life;*
4. *To see the relationship between the individual and the environment, be it the natural, physical or social environment;*
5. To develop understanding and faith in constitutional monarchy through the realization of one's own duties and responsibilities toward oneself and others;
6. To understand the principles of living together in a society and be able to follow those principles in which one believes;
7. To be informed about the danger of drug taking; and
8. To have pride in being a Thai and to cherish national sovereignty.[1]

Environmental education in the Life Experience Programme

The environment has been singled out in the description of Area 2 (Life Experience) and again in the general objectives of the Life Experience Programme. This is because the environment is considered to be closely associated with the life of every child: environmental problems exist at every stage and level of community life. Thus, it is appropriate that concern for the environment should appear as an objective of the primary education curriculum. Environmental problems are among the major concerns of the nation, so educational activities have become part of the joint efforts to promote environmental quality, as stated in the Thailand National Educational Scheme 1977, Section, 6, Item 52: *"The State shall undertake to inculcate awareness of the importance of conservation of natural resources and environment as well as population education."*[2]

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[1] Thailand. Ministry of Education. Department of Educational Techniques. *Elementary Curriculum* B.E. 2521, Bangkok, 1978. mimeo.

Thus, it may be assumed that the Life Experience Programme translates national policy into programmes of activities. The content of the Life Experience area of the primary education curriculum is organized into units as follows:

Grades I and II

Unit 1 : Living Organisms
Unit 2 : Family Life
Unit 3 : The Environment Around Us
Unit 4 : The Thai Nation
Unit 5 : News, Events, and Important Days.

Grades III and IV

Units 1–4 : Same as in grades I and II
Unit 5 : Occupations
Unit 6 : Energy and Chemical Substances
Unit 7 : Universe and Space
Unit 8 : News, Events, and Important Days.

Grades V and 6

Units 1–7 : Same as in grades III and IV
Unit 8 : Neighbouring Countries
Unit 9 : Transport and Communication
Unit 10 : Population Education
Unit 11 : Politics and Government
Unit 12 : News, Events, and Important Days.

Although the same title is used for units in all grades, the content varies in both detail and scope. In grades I and II the topics will generally be concerned with the pupils' immediate surroundings, such as the school environment, the quality of life in school and maintaining cleanliness. It will also deal with beauty and the balance of nature in the environment of the community, and give brief consideration to the nature of the earth's crust.

In grades III and IV the concern is still with community life but in more detail than in grades I and II. The topics also include water and air in terms of their importance, pollution problems and conservation.

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[2] Ministry of Education, *Thailand National Educational Scheme*, 1977, Sassana Press, Bangkok, Thailand, B.E. 2520.

Grades V and VI cover environmental activities which may not be so local to the school, such as deforestation and forest conservation, and water conservation, degradation of the biosphere and its protection. Environmental problems will also be mentioned in related units such as Population education, Energy, Chemical substances, Living organisms and Occupations.

Environmental education and the new teaching approaches

The teaching approaches advocated in the new curriculum are both effective and constructive when applied to environmental topics. The practical approach will develop in pupils not only problem-solving skills but also, through the process of solving environmental problems, a willingness to gather facts and information about the environment and an awareness of the problems which exist in their locality.

The emphasis of the new teaching approaches is on participation by pupils in classroom activities. Pupils are encouraged to take part in such activities as keeping the school grounds clean and orderly, looking after trees and the school garden, working in the library and co-operative store, working in the dining room, cleaning the classroom, and briefing guests about school activities. These reinforce classroom activities and help develop good habits and favourable attitudes among pupils toward the maintenance of environmental quality.

Lesson plans

By considering lesson plans at each grade level we shall be able to see how attitudes and values concerned with the maintenance of environmental quality can be developed among learners through classroom and school activities which have been designed around the pupils' lives. Starting at grade I and continuing up to grade VI, pupils will be encouraged to participate and to share responsibilities in preserving environmental quality at the level which is within their mental grasp. There are also moral issues listed under Character Education which are necessary for the development of correct attitudes and values concerned with maintaining environmental quality. Such values are constantly emphasized in the Life Experience lesson plan in the form of integrated activities. The following are samples of Life Experience lesson plans developed by the Curriculum Development Centre for grade I,[3] grade III,[4] and grade IV.[5]

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[3] Department of Educational Techniques, *Lesson plans for grade I: life experience, character education and work education, an integrated version.* Kurusapa Press, B.E. 2521, p. 97-100 (in Thai)

[4] _______. *Lesson plans on life experience, grade III.* Kurusapa Press, B.E. 2524, p. 75-76

[5] _______. *Lesson plans on life experience, grade IV.* Amarin Printing Press, B.E. 2524, p. 105-106 (in Thai)

Grade I, Unit 3 : The environment around us (10 hrs.)

Sub-unit 2 : ***Our community***

Item 6 : Maintaining the cleanliness and beauty of nature and the environment

Concept : ***The cleanliness and beauty of nature and the environment depend on the co-operation of all members of the community.***

Objectives : **To be able to:**

1. **Collect litter and rubbish and dispose of them in the proper places;**
2. **Identify public property in the community;**
3. **Refrain from throwing away rubbish in public places;**
4. **Help in looking after and taking care of the natural environment of the community;**
5. **Compare differences of environmental situations, between the well-maintained and the neglected ones;**
6. **Recall the advantages of keeping places and the natural environment clean and beautiful;**
7. **Co-operate in keeping the environmental surroundings clean and beautiful;**
8. **Use and store cleaning tools properly;**
9. **Draw pictures, make origami, build things from local materials or waste materials; and**
10. **Sing songs about how to clean things and the beauty of the community's natural environment.**

Content :

1. **How to clean things;**
2. **How to look after the beauty of nature and the environment;**
3. **The advantages of keeping the environment clean and beautiful; and**
4. **The disadvantages of neglecting the environment.**

Activities : **1.** ***Observe the rubbish disposal method used in the school and discuss the effectiveness of the method in terms of its cleanliness. the results of inefficient methods and proper ways of disposing of rubbish. Then do the cleaning.***

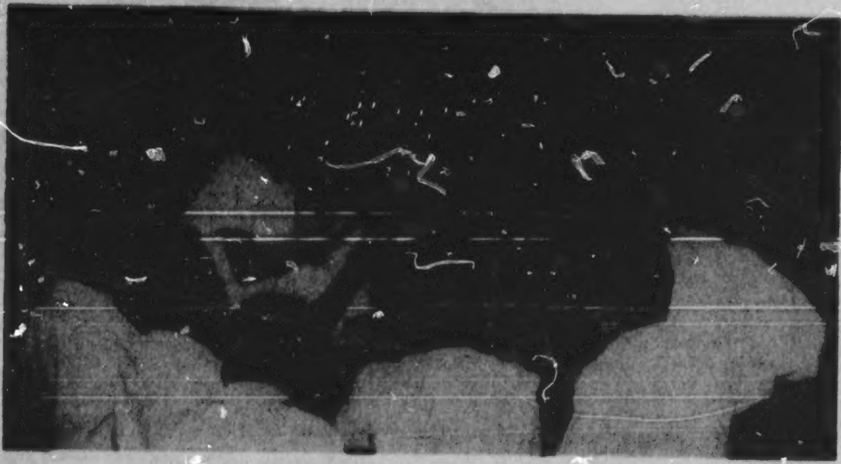
The pupils should practise in groups. Each group will have to report its performance.

Group 1 : clean the classroom and dispose of the rubbish properly.
Group 2 : clean the school playground and dispose of the rubbish properly.
Group 3 : clean the school yard and dispose of the rubbish properly.

Activities : **2. Study pictures of rivers, canals, roads and bridges and discuss who owns them and who looks after them. The pupils should identify public property in their community.**

Activities : **3. Take the pupils around the school to see public property such as roads, canals, rivers, ponds, bridges and statues, and ask them questions such as:**

- **Which looks bad to you and why?**
- **Any suggestions for improvement?**
- **How should you behave if you were to use the place?**



Students working in groups, guided by the teacher

Using the school garden as the learning environment

- If all of you use that place and do not take good care of it, what will be the consequences?
- Should you draw lines or pictures on public properties, and if not, why not?

Activities : 4. Relate a story about how to look after the cleanliness of public places and ask pupils to draw conclusions about the advantages of such practices from the story.

Activities : 5. Study from pictures or real-life such situations as polluted river water, polluted air and littering, and discuss the causes. Compare well-maintained and neglected environmental surroundings and think up ways to prevent environmental problems from arising.

Planting trees is one activity. A school vegetable garden is another.

Activities : 6. Assign pupils to plant trees around the school grounds, near the school or at public places and give pupils responsibility to look after them. The planting should follow discussion about the great usefulness of trees (fruit, nuts, shade, wood, sap, water catchment) and how they add beauty to the environment.

Activities : 7. Assign pupils to make themselves familiar with various cleaning tools and also to discuss how to store them after use. Use and store cleaning tools according to the discussions and assign pupils to take turns looking after these tools the whole year round.

Activities : 8. Assign pupils in groups to do the following:

- Draw pictures of clean and littered public places;
- Make paper bags to be used as garbage containers;
- Make brooms from coconut sticks;
- Make rugs from cloth samples;
- Make insect whips from banana leaves; and
- Collect pictures to make scrapbooks of public places.

Activities : 9. Sing songs about the cleanliness and beauty of the natural environment and get pupils to make gestures to the beat of the songs.

Grade III, Unit 3 : The environment around us

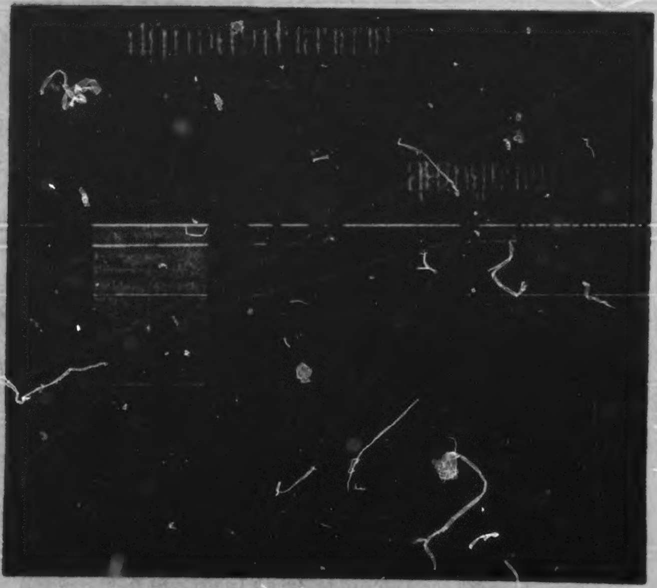
Sub-unit 2 : *Physical environment*

Item 1 : Water (10 hrs.)

Concept : *Water is the most important natural resource in our lives so we must all conserve it.*

Objectives : To be able to:

1. Name the uses of water;



Teaching aids for data collection and diffusion about the weather. Similar aids may serve for recording water data.

2. Make use of water in daily life;
3. Name substances that are obtained from water or that exist in water;
4. State the consequences of drinking polluted water;
5. Describe methods of conserving water;
6. Carry out methods recommended for the conservation of water; and
7. Draw pictures of plants and animals living in the water.

Social indicators of values which need to be emphasized

- Unselfishness,
- Generosity,
- Carefulness,
- Observation, and
- Thriftiness.

Content : 1. Uses of water in daily life:
- For drinking, bathing, washing and watering plants,
- For agriculture and industries,
- As a living medium for plants, animals and fish, and
- For fishing and transportation.

2. Items obtained from water bodies include fish, marine animals, shells, coral, salt, water chestnuts, reeds, lotus and other water plants.

3. Conservation of natural water and ways and means of preserving it; by
- Refraining from dumping rubbish, chemicals or sewage into natural water sources;

- Co-operating in keeping rivers and canals clean; and
- Identifying methods to make water clean and safe for drinking.

4. Consequences of the pollution of water:
- It becomes a source of infectious diseases;
- Shortages of water for drinking and for household use result; and
- It inhibits agricultural production.

Grade IV, Unit 3 : The environment around us

Sub-unit 2 : *Physical environment*

Item 1 : Water (21 periods or 7 hrs.)

Concepts : 1. *There exists in nature a network of water resources which are essential to human lives.*
2. *Water is the most important natural resource and we must all try to conserve it.*

Objectives : To be able to:
1. Identify natural water resources;
2. Name the uses of water in agriculture and fishing;
3. Explain the nature of water;
4. State the consequences of water pollution on the environment;
5. Identify measures to be taken to prevent water from being polluted;
6. Act rationally in various ways in preventing water from being polluted;
7. Make water safe for drinking and for daily use in the home; and
8. Draw pictures or write mottos campaigning for the conservation of clean water or draw pictures depicting the uses of clean drinking water.

Social indicators of values and achievements which need to be emphasized

- Unselfishness,
- Responsibility, and
- Awareness of the importance of natural resources.

Content : 1. Water resources and water cycle:
- Local natural resources (rivers, canals, ponds, lakes);
- Description of water cycle; and
- Conservation of forests and streams.

2. Uses of water in daily life: (expanded version of those for grade III)

3. Resources obtained from water: (similar to grade III (2)).

4. Use of natural water and its conservation:
- How to use water economically;
- How to keep water resources clean by not throwing rubbish or sewage into rivers, canals, or ponds; and
- How to make water clean and safe for drinking.

5. Unfavourable consequences of water pollution: (similar to grade III (4))

6. Making water safe for household use.

An aquarium for small fish with a record for students who are studying their living habits

Other teaching materials

In order to create learning situations where students will acquire problem-solving skills and be able to look for answers themselves, various kinds of materials need to be used. Reading materials are necessary to supply facts and information, not to provide direct answers to the problems being discussed or questions being asked. In grades I and II there are no textbooks for the Life Experience area, but starting from grade III there is one Life Experience reader being developed for each grade. These readers are meant to be used as reference materials for pupils. Besides these specific readers there are many other supplementary readers being developed by the Department of Educational Techniques and private publishers. Those areas developed by the Department of Educational Techniques and concerned with the environment include:

Life of Plants and Animals
The Sun and the Moon
The World We Live In
Water
Our Home
Scientific Experiments
Forest Resources
Tour Around the Zoo
Our School

These are being supplied to primary school libraries, and schools are being urged to acquire more. Prototype teaching materials are also being developed together with teachers' handbooks on how to make teaching aids which have been recommended in the lesson plans.

Conclusion

When the Primary Education Curriculum was first being drafted in 1974 and 1975 environmental education *per se* had not yet been recognized among those participating in the drafting committee. But they were all aware of environmental problems because their lives were very much affected by them, no matter where they lived—in the cities or in remote areas. Since the Life Experience Programme is centred on the problems of the learners in daily life, it contributes strongly to environmental education. ☐

Select references

1. Thailand. Ministry of Education. Curriculum Development Centre. *Curriculum Development Centre of Thailand, 1980.* Bangkok, The Centre, 1980. mimeo.
2. ________. ________. Department of Educational Techniques. *Elementary curriculum.* The Department, B.E. 2521 (1978).
3. ________. ________. *New curriculum.* Revised. Sasana Press, B.E. 2521 (1978). (In Thai)
4. ________. ________. *Lesson plan for grade 1: Life experience.* Kurusapa Press, B.E. 2521 (1978). (In Thai)
5. ________. ________. *Lesson plan for grade 3: Life experience.* Kurusapa Press, B.E. 2524 (1981). (In Thai)
6. ________. ________. *Lesson plan for grade 4: Life experience.* Amarin Printing Press, B.E. 2524 (1981). (In Thai)
7. ________. ________. *Thailand National Educational Scheme 1977.* Bangkok, Sasana Press, Thailand, B.E. 2520 (1977).

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A Malaysian Experimental Programme

ENVIRONMENTAL EDUCATION TRAINING FOR TEACHERS WITH A BACKGROUND IN THE HUMANITIES

by T. Chelliah

One of the attractive aspects of environmental education, and one which lends to the subject the greatest degree of flexible adaptation in a curriculum, is its interdisciplinary and intradisciplinary nature. While many environmental issues in education are rooted in the sciences, or depend on them for analytical explanations of cause and effect, it is a branch of learning that is most pertinent to the study of human society and its relationship with the natural environment.

The study of society and its place in the natural order of things—a primary concern of the humanities—is inextricably intertwined with the concerns of the biological or ecological environmentalist who deals with a biosystem that forms the foundation of the human habitat.

The interdisciplinary emphasis that is generally accorded to environmental education thus makes it capable of absorbing the relevant concepts of the social sciences and humanities to form a branch of learning that is all-encompassing and meaningful to a student of Civilization, Geography, Philosophy, Sociology, Economics or Law. In a unique way, a well-developed environmental education programme in the humanities offers exciting possibilities for designing a curriculum that provides depth and breadth to citizen training as part of the educational process.

A related factor worth noting is that the introduction of environmental education to the humanities curriculum helps to break up the unfortunate compartmentalization that has come to characterize the two high cultures of learning. The teacher of the subject can, by integrating the sciences and the humanities, demonstrate to his students that the two are neither mutually exclusive nor necessarily in conflict but rather enjoy tremendous complementarity. The methodological approach in the sciences that tends to answer the 'how' question is a natural corollary of the 'why' enigmas which appear in the humanities.

The fundamental concerns of the environmental educationist are the totality of living and the quality of life, and both are equally the central issues in the sciences and humanities. In bridging the gulf that has separated the two branches of learning, environmental education is a constructive and rewarding link in the understanding of human beings and their society. René Dubos made the observation succinctly when he pointed out that while humans are the product of their social and cultural history, everything they do is conditioned by their biological attributes. Dubos said, "The performance of each human group reflects biological necessities and propensities inherited from the evolutionary and experimental past.[1]

It would appear, therefore, that the fundamental question is not the validity of environmental education training for teachers or instruction for students with a background in the humanities; rather, it is the *method* that can most effectively convey environmental concepts to persons with a background in the arts and social sciences. The major criticism, to which attention has to be given, is that most teachers with a background in the humanities, or indeed school curriculum administrators, tend to seek the easy way; namely the incorporation of environmental education components in the subjects that are already being offered in the curricula.

The methodological problem posed by such an approach is that the straightforward incorporation of environmental education concepts does not constitute a rational integration of information available from the sciences and humanities into a well-knit holistic programme of study. The problem could equally arise with teachers with a background in science if no effort were made by them to establish interlinks with the humanities. From that point of view, an environmental education teacher with a background in science, but with little appreciation of the social values that govern much of the thinking by which public policy is developed, will be as ineffective as a teacher with a background in the humanities who is scientifically ignorant of matters such as technology, atomic energy and ecological phenomena.

Thus, the first major step to be taken is the training of teachers in environmental education as a special category of study. Teachers with a background in the humanities need to learn particular skills and be trained in certain basic requirements that will fulfil two specific purposes; first, the ability to single out the possible environmental indicators in the subject that forms their academic background and, second, to integrate those indicators with scientific data. In order to achieve these objectives, teachers have to go beyond their personal ingenuity in detecting the environmental implications of a topic, or the discovery of relevant material that will complement their teaching. They need professional training in skills that will equip them to

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1. René Dubos, "Humanistic Biology" in *The American Scientist*, Berkeley, California, 1965, No. 53.

integrate knowledge in a way that will also stimulate their pupils to show greater awareness of the environment around them.

This article is concerned with an attempt that is being made at the Faculty of Education, University of Malaya, to train teachers with backgrounds in science or the humanities to teach environmental education. The objective of the programme is to develop an interdisciplinary course which does away with the traditional boundaries between the various disciplines.

The course does not seek to teach the basic science concepts and principles, manipulative skills and experimental procedures necessary for environmental scientists and science educators. What is intended is to give to students a clear perspective of the environment, to enable them to understand the fundamental problems of the environment in relation to development and society, what science and scientists can do about the environment and how the sciences, humanities, environment and society interact. The general aim is to discuss selected issues and problems which are not too scientific but which are nevertheless thought-provoking within the context of the various subjects in which the teachers have specialized undergraduates. The expectation is that this approach will provide a learning experience which would instil in them and their future pupils an interest in the subject and an ability to keep abreast of environmental issues.

In order to emphasize the interdependence that is emphasized in current approaches to environmental education, the course does not limit itself to the graduates of any discipline. It is offered as an optional course in which students enrol at their choice. The enrolment has had candidates with a wide variety of subject combinations including Geography, History, Economics, Commerce, Malay Literature, English Language, Islamic Studies and Civics. In planning the structure of the course, the following guidelines have been followed:

1. The subject content is carefully selected and presented as a whole to illustrate why an issue cannot be teased into its scientific and humanistic components but has to be viewed in its entirety to understand its full implications (an example of which, the Straits of Malacca, is discussed later);
2. The content is based on a few themes and problems of current interest and the course built around them;
3. An attempt is made to avoid the traditional approach to teaching basic scientific principles;
4. Appropriate methods and techniques are selected to give teacher trainees with no background in Science first-hand experience of environmental issues without going through tedious, conventional laboratory work; and

5. An attempt is made to make the course intellectually stimulating for a group with diverse academic backgrounds.

At the beginning of the course each year, the candidates' knowledge of environmental education is tested in a questionnaire. To the question, "what do you understand by the term environmental education? " responses have varied from vague references to ecology to pollution study, outdoor and field studies, exploitation of nature and even religious understanding of nature and of creation; interestingly, the answers to this question have shown greater understanding of the subject from year to year. This may be attributed to the increasing attention given to environmental issues by the news media, and the accompanying increase in public interest. To the majority of the participants, the concept of environmental education was not new; what was new was the realization of the need for a methodology for teaching it through their subject specialization.

When asked to name the foundation disciplines that they thought were suitable for environmental education, surprisingly, the subjects most often stated were the Health Sciences, followed by Biology, Geography, Civics and Economics. This clearly indicates the lack of comprehension by the students of the scope and nature of environmental education.

The course is designed for 20 hours of instruction in class (two hours per week for ten weeks) and an additional three hours on weekends for field visits. Lecture and discussion topics are:

1. The organism and its environment–understanding basic ecological principles;
2. Development and the environment–understanding relationships between all aspects of development and its impact on the environment;
3. The nature and scope of environmental education;
4. a) The need for environmental education,
   b) The genesis of environmental consciousness in Malaysia;
5. Identification of environmental problems and selection of themes suitable for use in schools;
6. Identification of topics in the various school subjects appropriate for the integration of environmental concepts;
7. The integration technique–approaches to the incorporation of environmental concepts into existing topics;
8. Methodology and approaches to the teaching of environmental education;
9. Resources for the teaching of environmental education; and
10. Laboratory and outdoor activities for environmental education.

The course evaluation is carried out through written assignments and projects. The reports are presented orally to the course participants before being submitted for evaluation. This gives students the opportunity to learn from common experience and to judge suggestions for incorporating environmental education in the various disciplines and the possibility of teaching it through these disciplines.

The teacher trainees work on their assignments in pairs, to save time in the preparation of audio-visual materials or the conduct of field visits. This practice produces interesting results. It gives them the opportunity to share ideas based on different disciplines and to understand the potential of these different subjects for the teaching of environmental education. This experience is novel in a teacher-training programme because it is rare for students to learn about other subjects and disciplines, let alone collaborate with students in disciplines far removed from their own. It also helps them to comprehend the philosophy of team-teaching, especially in a subject of such an unorthodox nature.

A review of the kind and variety of work done by teacher trainees indicates how the technique of integrating environmentally-related issues through the various humanities subjects can be achieved. These are some of the assignments carried out by students:

1. *Development of curriculum materials*

For this assignment students were required to work on the syllabus of either their first or second subject. They had to examine the syllabus either by topics or by concepts, and were required to:

a) Select topics that they felt were most suited to the integration of environmental education concepts;

b) Identify and state clearly the concepts, principles and skills that are involved in the topics identified;

c) Formulate in sequence and knowledge structure the facts, concepts and principles;

d) Discuss in detail how they would plan laboratory activity or field experience related to the topic; and

e) Suggest appropriate audio-visual materials.

This assignment proved to be a favourite among the Geography, Economics, Civics and Commerce students since related topics and environmental indicators are abundant in these subjects, topics such as erosion, agricultural development, deforestation, trade, technology, industry, food, forestry, mining, individual and social rights, population, health and disease, land forms, air, water and soil, weather, natural resources, energy sources.

2. *Instructional resources for environmental education*

Students were required to choose a topic or problem of current interest and prepare:

a) An interdisciplinary action-oriented instructional module for primary, secondary or adult education; and

b) Suggest teaching materials and audio-visual aids.

The students were inclined towards specialized themes such as the proposed atomic research station in Malaysia, water pollution, understanding water, deforestation and conservation. These assignments required a great imagination and involvement with the literature available as well as possible use of field studies to provide practical information.

3. *The role of the mass media*

The teacher trainees were required to make a list of recent environmental education programmes and campaigns in the country and discuss their objectives, implementation and results. They then discussed in detail how they could use this information in teaching their subjects.

Reporting on the role of the mass media and environmental campaigns proved exciting because it was the first time that it had been done as part of an educational undertaking. Current campaigns on issues such as litter, national parks, forests, ecological sites and historical sites and monuments were studied. Some students took part in the campaigns themselves.

4. *School environment*

Having been told that teaching and learning need a healthful environment, students were asked to examine the environments in schools, to report on shortcomings and to suggest improvements.

This involved the trainees in visiting rural and urban schools to study the impact of environmental factors and to draw conclusions about the sort of conditions that ought to prevail in the school environment.

5. *Methodologies for environmental education*

Taking the environment as a natural resource for learning, students had to choose a particular area and discuss how they would use it to teach specific content in their subject areas.

Schools are often required to conduct visits which can easily become a sort of non-educational picnic outing. In the case being described, no effort was spared to gain work experience. Areas chosen were those easily accessible, such as a quarry, an urban slum, a mangrove swamp, a low-cost housing area, a public beach, and various types of residential areas. Students majoring in language derive special advantage from this assignment in teaching skills such as comprehension, writing and vocabulary.

At the end of the programme, students complete a self-evaluation questionnaire to test their understanding of the programme, to indicate whether it has achieved its objectives or not and, more importantly, to help the students evaluate their ability and expertise as potential school-teachers in the handling of environmental education. The response has been encouraging; respondents were positive about their ability to introduce environmental concepts through their various disciplines, and to use skills such as collecting relevant information and identifying topics and methods of teaching. The areas that students felt required further training were laboratory work, co-curricular activities, locating and using resource personnel and materials, and the planning of field trips.

One interesting response was that separate time should be allocated in the course for discussion at length on integration exercises in specified school subjects. Every week individual students were asked to list current topics and issues on the environment like those reported in the press. At the end of the week a class discussion was held where individuals suggested ways they could incorporate these current issues in their subjects. The following schedule was used to develop the summary of the discussion in each of the trainees' subject specializations. Students felt time did not permit detailed discussions of the various activities that could be planned by the teacher. This exercise, highly recommended for a programme of this nature, was rated by the trainees as practical and useful.

Figure 1. Discussion schedule for environmental topics and issues

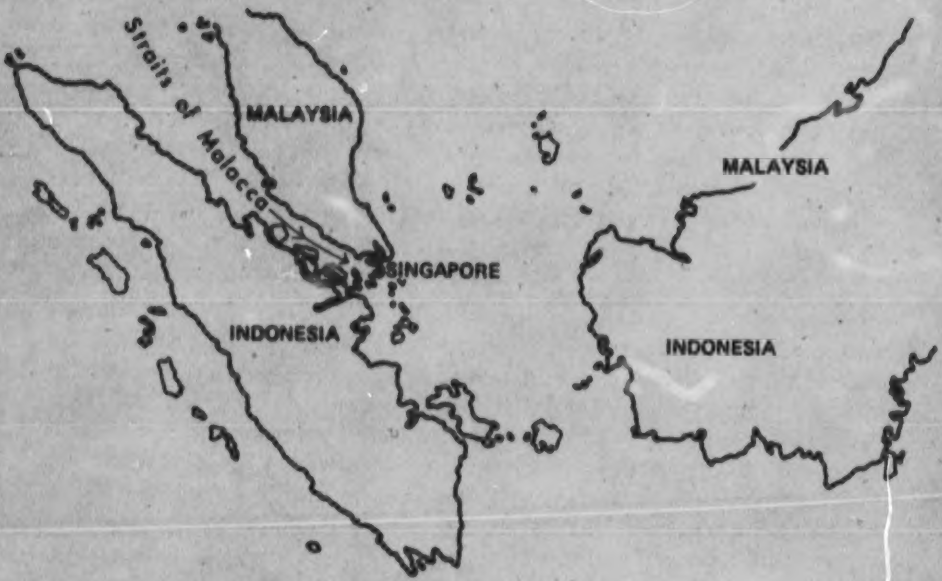
Subject	Geography				
Topic/Issue / Level	Form 1	Form 2	Form 3	Form 4	Form 5
Land clearing					
Siltation					
Campaign on Batu Caves					

As this is a unique and experimental programme a follow-up study was needed to see whether the participants had put into action the experience gained during the course at the university. A questionnaire was mailed to the course graduates and the response was encouraging. Within the constraints of time, the rigid structure of the school system and the need to meet examination deadlines, course participants were still able to include some elements of environmental education in their particular subjects. Major activities such as projects, surveys and field trips have been generally realized through extra-curricular programmes sponsored by student clubs and societies. The requests that teachers made for further information on content, teaching guides, resource materials and in-service programmes are good indicators of their sustained interest and enthusiasm.

The teacher-training model just described ran successfully for three years and indicates that teachers with a background in the humanities can be trained to impart environmental concepts through various disciplines. This multi-disciplinary dimension demands that the course instructor be well-informed of:

1. Environmental principles and issues;
2. Teaching techniques and methods;
3. Techniques of integration;
4. The possibilities available within the syllabuses currently followed in schools; and
5. Resources for the teaching and learning of this subject.

By illustrating and highlighting carefully selected environmental concepts within the subjects offered to trainees, and by stimulating an interest in making observations on the state of the environment during field trips and report writings, a conscious and active commitment is evoked in the trainees not merely to include but to emphasize aspects related to the environment as an integral part of their instruction. The inter-disciplinary and intra-disciplinary training of teachers with a background in humanities enables them to broaden their horizons and increase their awareness of the significant contribution that science can make to the explanatory process of inquiry. It also entitles them to teach the values of environmental education with the necessary skill and confidence.



A TEACHING MODEL IN THE HUMANITIES: THE STRAITS OF MALACCA

This topic from the humanities can be used effectively to promote interdisciplinary approaches to examine the environment with data drawn from the related studies of Geography, Geo-politics, Economics, Ecology, Marine Sciences, Fisheries, Oceanic Traffic and others. It is currently a subject of great political and environmental interest.

Environmentalists feel that the political positions taken by the various interested nations, and the problem of ownership or right of free passage on the narrow Straits, are incidental to the primary problem: the preservation of the health and safety of the Straits as a waterway. They feel that if the issue of the environmental factors, associated with the present deteriorating state of the Straits, is not urgently attended to, national leaders in the surrounding countries will soon have to debate not the seaway but the 'sewer' that the Straits of Malacca will eventually become.

While the responsibility of ensuring the environmental health of the Straits should be equally shared by all nations using it for their economic objectives, Indonesia, Malaysia and Singapore will have to exercise the greatest vigilance. This is not only because there is a 12-mile territorial claim by these countries, but also because of the geographical and ecological relevance of the Straits to their economies and livelihood. An illustration of the critical importance of the Straits is that the waterway is responsible for much of Malaysia's maritime food supply and revenue. It provides Malaysia with 74 per cent of the protein intake of its people. It yields each year 50,000 tons of prawns, of which 17,000 tons are exported, earning M$100 million annually.* The cockles and other molluscs that are harvested bring an income of M$15 million. The vast resources of the Straits account for the livelihood of more than 100,000 people. The fishing industry in Malaysia is in great trouble as some 55 per cent of coastal fishermen, on both coasts, live below the poverty line—and most are under-employed. Aquaculture or fish-farming is being proposed as an alternative for such fishermen. The Straits of Malacca, if it were clean, would be a great asset to both the fishermen and the economy at large.

One of the fundamental causes of pollution in the Straits has been the vast number of accidents caused by inadequate safety measures on giant oil tankers that use the waterway. The reopening of the Suez Canal was particularly relevant to the problem for its dramatic increase of traffic in the Straits, said to be about 30 per cent. Now at least 15,000 ships use the Straits each year. Most of the traffic is composed of tankers, mainly Japanese, transporting crude oil from West Asia. The increase in traffic increases the likelihood of accidents, collisions and groundings of vessels. In 1971, a total of six accidents occurred involving supertankers of more than 200,000 deadweight tons. In January 1975 the supertanker 'Showa Maru' ran aground close to Pulau Sebarok, three miles off Singapore. It was carrying a full load of 224,000 tons of crude oil from the Persian Gulf to Japan. The grounding caused the rupture of three tanks, discharging an oil spill of about one million gallons. In October of the same year, the cargo ship 'Tolo Sea' with a cargo of 200 tons of bunker oil ran aground off Penang harbour, resulting in another spill. A disaster causing considerable damage to marine and plant life occurred when the 'Diego Silang', a Philippine tanker, collided with two other ships nearly 12 miles off the coast between Batu Pahat and Pulau Pisang. Six thousand tons of oil were spilled covering an area of 450 to 500 square miles.

Accidents, the extent of traffic and the tragic dumping of oil wastes into the Straits will earn for it the reputation of being the sewer of Southeast Asia—a mariner's nightmare where traffic safety is concerned. It is rapidly becoming one of the world's dirtiest maritime backlanes—a situation brought about by indiscriminate and irresponsible use.

The overall effect is an imbalance of the delicate natural ecological equilibrium, leading inexorably to the introduction of drastic changes in economy and marine life. The enforced change in the natural ecology has already caused the destruction of plankton, a natural food source for fish. Hence the fish population has shown a drastic reduction and certain species have been destroyed. This will naturally have a bearing on the fishing industry, and on the availability and price of certain fish for the consumer.

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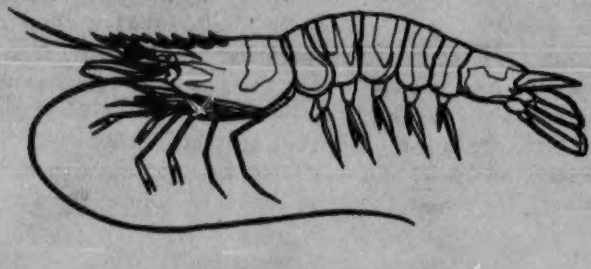
* Approximately 2.20 Malaysian dollars (M$) = one US dollar.

The coral reefs are under constant threat. The many crevices and recesses among the coral structure provide shelter to young fish and the larvae of many marine organisms. They are ideal breeding places where eggs are laid with a high degree of security. The reefs are an important breeding ground for lobsters and all molluscs and are the habitat for fish such as groupers *(Epinephelus)*, parrot fish *(Scaridae)*, rabbit fish *(Signaus)*, fusiliers *(Caesio)* and snappers (*Lutjanus*), which comprise the major varieties of fish landed in Malaysia. It is estimated that almost 49 per cent of the world's coral reefs occur in the Indo-Pacific region, and that about 9 per cent of present commercial oceanic fish landings are from coral reefs; therefore these reefs must be protected. Natural causes exercise their toll, but pollution has a greater toll on the reefs. Due to poor land management, sedimentation caused by flood run-off from land has caused the reefs to [illegible] bathed in brackish, silt-laden water. This prolonged coating and burial by sediments will eventually result in the death of the reef.

The oil discharge and traffic disturbances are the third major source of threat. Evidence shows that chronic oil pollution may prevent normal settlement and development of coral larvae. Chemical pollutants from agriculture and industry are another threat, since there is poor management and treatment of toxic effluent discharge.

The mangrove swamp is ecologically a vital habitat. It is not only the habitat of much marine life but also a vital area for the spawning and breeding of marine animals and breeding plants. The destruction of the habitat could cause irreversible damage to the dynamics of marine life. The effect of pollution on marine life has severe repercussions on Man. The depletion of fish, molluscs and marine food sources affects the livelihood of more than 100,000 people, and a prime protein source of the nation. What fish are available are made even more difficult to catch because of the damage to the nets by the oil spills. Oil spills not only make the nets sticky, deterring the fish from approaching them, but hasten the rotting of the nets.



The first line of defence against oil spills is the use of non-toxic dispersants which help to break up the oil blobs into tiny drops. The danger of this practice is that it only helps to disperse the tiny drops further. Also, the use of detergents could increase the intake of chlorinated hydrocarbons, which are predicted to cause cancer in living things. An oil slick takes only about 36 hours, which is about the duration of three tide cycles, to blacken both shores of the Straits. Hence there is a constant danger to the littoral countries of Indonesia, Malaysia and Singapore. With pollutants such as oil, sewage, metals, chemicals, sediments, radio-active and carcinogenic materials being steadily introduced into the Straits, fish are not only more expensive and contaminated, but there exists an even greater danger to the vital need to maintain ecological balance and preserve the economic wealth and resources of the sea.

The situation demands an immediate rigid control of traffic with a neat traffic separation scheme; stricter control on the dumping of wastes; a greater keel clearance space, from the present one-to-two metres for fully laden ships to a safer depth; and strict imposition of penalties on oil tankers that cause pollution (as specified in the Malaysian Environmental Quality Act 127, 1974). And not least, there should be a constant and vigilant 'biological watch' on the behaviour of the marine population as they are the sensitive, accurate and natural indicators of the life-supporting capacity of the Straits.

In studying these divergent problems, environmentalists with a background in humanities will find it rewarding to combine the expertise of their academic skills with those of the marine scientist, and to approach the teaching of the subject from a holistic perspective.

TRAFFIC RULES FOR MALACCA STRAITS

Since this article was prepared, shipping in the Straits of Malacca has been subjected to a traffic separation regulation. Introduced on 1 May 1981, and enforced by the littoral states of Malaysia, Singapore and Indonesia, the scheme states that: Vessels will be required to keep to the starboard side of the channel and observe other regulations aimed at preventing collisions at sea. Beacons, lighthouses, buoys and other traffic signals have been installed at strategic points along the Straits, which is considered to be one of the busiest sea lanes in the world.

The plan does not bar tankers from the Straits as feared by oil importers, but could exclude some supertankers through depth limits on vessels passing through the waterway.

Tankers which do not meet sea clearance regulations will have to take the longer and more expensive journey through the Sunda Straits in Indonesia.

Source: *The Nation Review*, Bangkok, 21 April 1981

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OUT-OF-SCHOOL ENVIRONMENTAL EDUCATION

by M. Atputhanathan

Introduction

During the last few decades, there has been disillusionment in developing countries, particularly in the region of Asia and the Pacific, regarding formal education imparted through schools and modelled mainly on the Western system. This disillusionment came about when school systems failed to develop people in the proper way and utilize human resources fully in the rapid development taking place. It is felt that both human resource development and the improvement of the quality of life are essential for the proper development of a country. Many aspects of education, especially science education, are far removed from the actual environment of the people. This has resulted in an increasing concern for environmental education in recent years.

Although environmental education has formed the topic of many curriculum development seminars and several regional and international meetings, there has been very little consensus on what environmental education should consist of, at what levels of education environmental education concepts should be integrated, what strategies should be adopted to impart knowledge and which environmental education components should be emphasized at each grade level.

An attempt will be made in this article to refer to the experiences of the past decade-and-a-half in the field of out-of-school education in Asian countries as well as in Europe and Africa to bring clarity to these concerns.

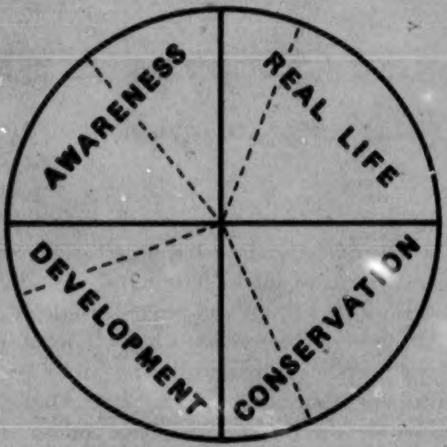
Elements of environmental education

Four main components can be identified if one takes into consideration the deliberations of the past decade-and-a-half on environmental education. These components are indicated in Figure 1, overleaf. The relative sizes of the segments will vary with the age level at which the programme is being introduced. At the primary level for example, working with an age group of six to eight, the main emphasis would be on awareness. A second emphasis would be on real-life situations. But there is bound to be an overlap of the components as one selects environmental situations for study.

Awareness. This would mainly mean alerting one's senses to the physical, social and aesthetic aspects of the environment through:

1. Anthropology, which considers human beings as constituting an important part of the environment;

Figure 1. Environmental components



2. Stressing of inter-relationships which exist between environmental components and the dynamic nature of the environment;
3. Recognition of a very broad range of elements, tangible and intangible, such as plants, animals, soil, ways of life of man, man-made materials, sound, light, energy, and the earth, the solar system and the universe; and
4. Understanding as far as it is possible from today's knowledge of the ecological principles governing the environment.

Real-life situations. To link education to life, the educator needs to identify the situation, both local and national, which may vary from country to country. Within a country there will be different local situations. For example, in intensive agricultural areas like the north of Sri Lanka, the study of soil pollution from agro-chemicals, life cycles of agricultural crops, rainfall patterns and water-storage patterns would form real-life situations. In fishing areas like the Maldive islands, which are in close proximity to Sri Lanka, tides, breeding of fish inshore and off-shore and deep-sea fishing, principles of weather forecasting, and fish processing techniques are major aspects of life. Similarly if one takes a country like the Socialist Republic of Viet Nam, duck-hatching and spawn collecting and breeding in the village of Bac Ly, and sugar-cane and jute growing on lands reclaimed from Red river are two examples of working with real-life situations. Generally, activities in real-life situations would be focused on economic activity, nutrition and health, hobbies, clothing, weather, specific environmental hazards and specific problems relating to energy. Unlike the awareness programme where the stress would be on attitudinal aspects of the environmental study related to life, an understanding of the fundamental concepts and practical methods would be essential components of education.

Conservation. This means the careful exploitation of the environment for the benefit of the *present* generation with due consideration given to *future* generations. This theme needs to underly any educational programme on conservation as it stresses the correct attitudes to be developed towards conservation of environmental resources so that they can be harnessed and used by present and future generations. Identification of the minimum forest requirements, reforestation, conservation of endangered flora and fauna, recycling of resources, controlling soil erosion, and preventing over-exploitation of the sea resources—these are some of the topics considered under conservation. Some issues which are normally local may sometimes be considered at the national or even global level. These issues include over-exploitation of fossil fuels and the destruction of forest reserves.

Development-based problems. This aims at identifying and harnessing environmental resources for development with the assistance of specialists. Involvement in development-based problems brings elements of correct attitudes toward solutions to problems of the country, research, and work-oriented learning and involvement with the community at the levels of both laymen and experts. Some development-oriented projects, where students have been involved and have benefitted, would illustrate these aspects of environmental education:

1. Regional camps on the Green Revolution (held in Sri Lanka) and attended by four countries, where the activities and thinking of students, teachers and experts gave a broad insight into the term Green Revolution.[1]
2. Participation by students, specialists and teachers in activities, such as the hydro-biological survey of a lagoon in Sri Lanka[2] that was blocked and de-salinated; reclamation of land; breeding of inland fishes and promotion of agriculture. This programme,having continued for 10 years, has the triple interdependent objectives of research, science education and national development. Its tentacles have spread into other areas such as popularization, conservation, social development and living as well.[3]
3. Substituting solar energy for traditional forms of energy is a topic that is being considered in different parts of the world to make people aware of the limitations of energy resources and exposing them to new technologies which have been developed for harnessing solar energy.
4. The study of palm products is another development-oriented project aimed at the underdeveloped resources of the Palmyrah palm. This is being promoted primarily in Tamil Nadu, India,and to some extent in Sri Lanka.

There are also a variety of other development-oriented projects such as the 'blue revolution', pollution and alternative sources of proteins that are attracting attention.

The characteristics of environmental education

In formal education, pupils and teachers concentrate on knowledge which is built-up into disciplines. But when one looks at the environment, one has to look at a body of knowledge normally taken up by separate disciplines in a curriculum which should now be integrated into a whole. Environmental knowledge—whether the appreciation of sounds in the environment or the understanding of weather or the study of phenomena behind the decline of elephant populations—exists in an unsystematized manner, unlike the neatly and logically laid-out disciplines of physics, sociology or chemistry. A third characteristic of environmental knowledge is that it is not static but changes with time and place.

These changes are faster in the developing countries due to the rapid rate of development. This is one of the main reasons why formal curricula sometimes fail to have the necessary impact and are often out of context with the real problems of the country. Understanding and appreciating environmental issues is a life-long process. Hence, teaching and learning should be not only for those in schools (future citizens) but should continue for those in the community (life-long education).

The strategy: out-of-school education

It is proposed here to identify what out-of-school education stands for, and how it has been interpreted and worked out by the International Co-ordinating Committee for out-of-school science and technology education (ICC) during the past decades.

Out-of-school education comprises all those activities undertaken outside the formal teaching period and the formal curriculum. This activity can take place in a free-activity period in the normal school day. It can also take place in another institution or even in semi-institutionalized locations such as camps, homes and ad-hoc centres. Out-of-school education (or non-curricular education as it is sometimes described) covers all those aspects of education which an individual pursues as a result of *his own choice*, with or without the help of institutions provided for this purpose. This is distinct from informal education which is brought about by the influence of various factors of the environment on the individual (also called socialization). It is also distinct from formal education which is defined as a limited organized encounter between the student and the teacher with the help of the curriculum.

In planning out-of-school activities, particularly in relation to environmental education, it has always been emphasized that this should be supplementary to formal education in any country.

Due to the very nature of environmental education and the fact that science and technology form an important ingredient, it is not possible for formal education to keep up with progress. This is because in all formal educational systems there is a built-in time-lag between what is taught and the actual frontiers of knowledge. This time-lag is apparent in science and technology and environmental education and cannot be better explained than in the words of the late Rene Maheu, former Director General of Unesco, who said somewhere, "Scientific and social transformations in the modern world are so rapid that teaching institutions including the most modern and the best developed are not able to assume alone all the responsibilities they face and it is indispensable to pay greater attention to the out-of-school education of youth."

Whether it be focusing attention on observation of flowering plants of the country, preventing wanton destruction of trees, calling attention to the grave dangers of pesticide poisoning or undertaking community-oriented development projects like development of the under-utilized palmyra palm—or any of an infinite number of other actions—out-of-school activity must take into account the following points:

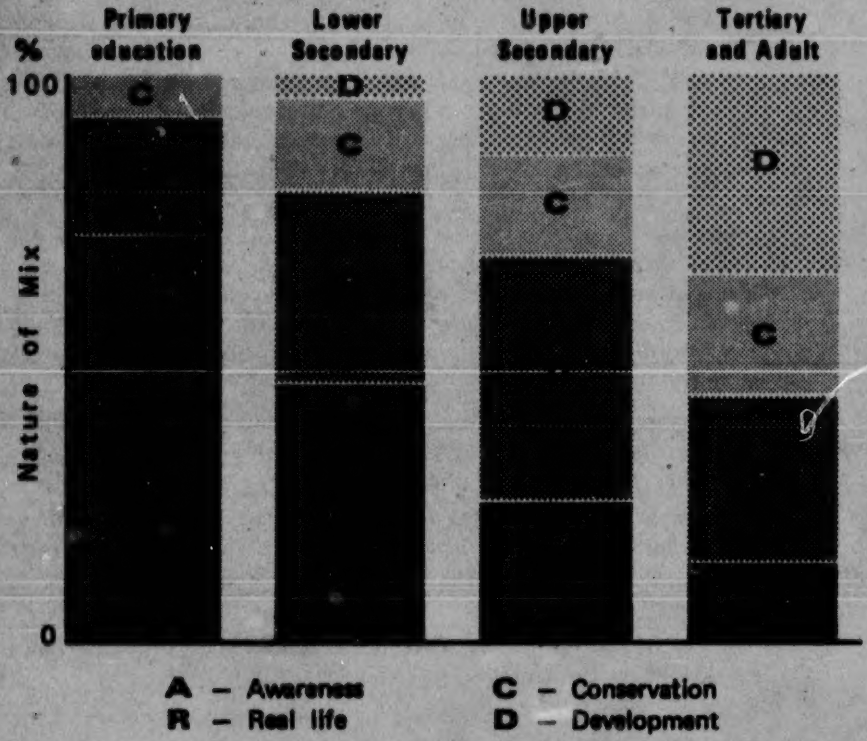
1. The technology used has to be up-to-date and needs not only school and university teachers but experts in such fields as horticulture, chemistry, entomology, aesthetics or forestry;
2. Each of these topics involves looking at many aspects of the problem such as the scientific, sociological, or aesthetic, and these do not exist as separate compartments but rather as an environmental problem into which all of these aspects will be woven;
3. The programme has to suit the recipient and meet the criteria of the locality where the activity is to be based;
4. The emphasis has to be on developing correct attitudes, for which the interaction ratio may be as low as 1:3 or 1:5 and the programme has to have a personal touch; and
5. The programme should be closely associated with the world of work, real-life situations and values.

To achieve this, the programme must be tailor-made, taking into consideration the age group, the nature of the environmental problem and the knowledge, skills and facilities available. Hence, out-of-school activity has been found to be suitable for environmental education and this has led to the proliferation of out-of-school environmental educational institutions in many countries.

Matching programmes, age groups of students and out-of-school methods

Figure 2, overleaf, gives a rough idea of the relative percentages of the different types of environmental education that would be suitable for different age groups.

Figure 2. Approximate percentage of types of environmental education suitable for various stages of education



At the primary school level many countries have environmental awareness programmes in their formal curricula. The out-of-school activity programme tried out at this level is of two types:

Week-end programmes. These can be either in the school or at an out-of-school centre where an environmental programme on real life and awareness has been arranged. One such type, designed for an agricultural subsidiary crop-growing community, is described: "They visited the farming plots, learnt folk songs, saw planting of onions, and learnt about the root system of these onions, the watering methods, the weaving of onion baskets, care of vegetable plots and sharpening of instruments.[4]

One-day programmes. These may be held in an out-of-school centre or in the school where children meet selected people from the community, visit people at work or make sketches of nature sites such as the seashore, coral, mountains or trees.

Invariably these are planned to supplement formal education. It is through these programmes that the students become aware of up-to-date ideas and experiences. When students go to the out-of-school activity centre for a week-end, they sometimes meet peers from other schools and this helps in the exchange of ideas and community living. Experiences gained in these out-of-school activities could be ploughed back into formal education very easily at this primary stage.

The programmes for lower-secondary and upper-secondary schools and even for those who need continuing education are similar. The upper-secondary and tertiary students and adults are in mixed groups, especially when the programmes take place in an out-of-school activity centre or when a project is organized by the school. Sometimes projects are designed separately for separate groups. The common forms of activities planned for environmental education at these levels are camps, workshops, seminars and projects.

Camps are primarily residential. The term 'camp' has come to be used in out-of-school programmes and it does not necessarily involve working in tents, but working under varying improvised conditions. These camps can be held in permanent institutions or in temporary buildings or tents. Salient features of the camps (or workshops as they are sometimes termed) are:

1. The participants are there of *their own free choice*. Sometimes when there is a greater demand, additional camps are held or a selection is made of the most interested participants. This is done by means of questionnaires and recommendations.
2. The programmes are mainly for life- and development-oriented projects. Sometimes one component may overlap the others. It is also possible that a series of camps has to be held to focus attention on a project.

At camps for development of the palmyra palm (Borassus flabellifera) products at Thondai-manaru, Sri Lanka, out-of-school activity centres are established. This is an example of a development-oriented environmental programme. It was organized through a series of camps, each of five-to-seven days' duration, to focus attention on different aspects of this palm. The first camp was on palmyra seed and the edible portion of the seedlings' roots. The second camp was on palmyra leaves, the third on palmyra fruit juice and the fourth on the sweet exudation from the cut end of palmyra inflorescences.

At each of these camps community members, research organization personnel, students and adults participate. There is interaction where everyone benefits and the findings are published for laymen. The research workers take with them samples for future investigation. The problems of communities living in the palmyra-growing areas are discussed and studied. In addition, the conservation of these useful palms, replanting techniques and the aesthetic and market value of ornamental material made from palmyra are also discussed.

The usual teacher-participant ratio in these camps is around 1:5 (in out-of-school activity, a teacher or a similar person is called a leader). In residential camps, no time limit is fixed for work. Everyone works as a team and the work may continue late into the night. This type of work includes a generous mixture of academic discussions and manual work, both in the laboratory and in the field.

The nature of these activities is such that an open-ended approach is used in contrast to the cookbook approach in formal education systems. It is not at all surprising to record that the outcome is of a high standard and that very often the research workers are astonished by the originality displayed by the student participants.

There are some interesting off-shoots of these camps worth mentioning. They are community living, the diffusion of ideas generated in the camps into the community and creation of a young band of catalysts and performing actors who take contemporary ideas into the adult community.

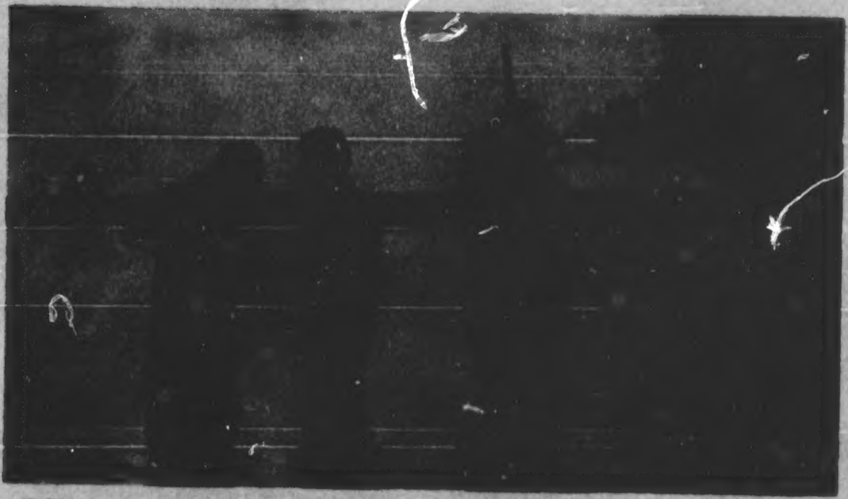
Another type of out-of-school activity tried out at the school level and at out-of-school activity centres is project work, an environmental activity such as the development of a village, updating a local craft and planning reforestation activities with experts and laymen. The project is normally planned over a period determined by the quantum of study and work. The school or the out-of-school activity centre becomes the centre of planning and execution. The participants get together at definite intervals, say at week-ends and on holidays, to plan and execute the work. Most of the features outlined for camps are applicable here except that participants do not stay for long periods of time.

Seminars usually last just one day. The work component is minimal but, within this eight to twelve-hour period, there is considerable interaction between experts, laymen and students and there is demonstration of activities, supported by audio-visual facilities.

Sometimes these seminars supplement camps and project work. For example, a series of seminars was held for fishermen to supplement project work on stocking a lagoon with economically viable species of fish. This was a two-year project. The fishermen were informed about the latest techniques of catching the correct size of fish, throwing young ones back into the lagoon. Feeding techniques and fish-culturing techniques were other issues that were discussed. Thus in these seminars real-life activities are combined with aspects of conservation and development. The participants are mainly adults who need continuing education to help them carry out activities like stocking lagoons with fish, with help from fishermen.

Institutionalization of activities related to environmental education

Out-of-school activities may be organized for different purposes. They



Taking water samples for chemical analysis from the Thondaimanaru Lagoon (p. 285)

may take the form of camps which give leadership training or of workshops to update certain techniques or to give training in management procedures.

The environmental education programme outlined in this article has been used in many countries under the rubric of out-of-school activities and has met with success in special institutions developed for this purpose. Such institutions have been established in various parts of the world, some partly and others purely confined to out-of-school activity. Some of the latter types are affiliated to ICC (a non-governmental organization with consultative status in Unesco). Experience during the past decade-and-a-half shows that institutionalization of out-of-school education is an essential factor in promoting environmental programmes. It allows an infrastructure to be created to emphasize various types of environmental problems and to organize programmes for different age groups.

The very nature of out-of-school education makes it imperative that whatever form of infrastructure is developed for this purpose, it should be *non-governmental* in origin. Only then is the institution free to develop multifarious activities and encourage a spirit of dedication among those who run it.

Further, such institutions should be localized and should begin operating with *interested* and *willing persons*. They should not be fostered by any outside agencies. Whenever there has been interference from an outside agency, the institution has not functioned successfully or has stopped functioning altogether. This does not necessarily mean that an outside agency, governmental or otherwise, should not offer help. Outside agencies should provide financial, moral and technical support but they should not control the institutions from the outside.

The institutions have the blessing and support of the national government. The continuity of such institutions and the co-ordination and support they get from various agencies depend greatly on the recognition given them by the government.

Training of leaders for out-of-school education

One of the functions of out-of-school education centres is to train the leaders for environmental education through out-of-school activities. It is apparent from the foregoing discussion that such training must recognize the following points:

1. Leaders are not teachers in the sense that they are in formal educational institutions, but are people who are experienced in working with youth and are *willing to learn constantly*;
2. Leaders have to work with youth in a process of exploration of the unknown; this type of exploration needs to be done with close personal contact with from three to five motivated young people to each leader;
3. Adaptability to various tailor-made programmes and adaptability to improvised working conditions are built into most environmental activities; and
4. Leaders have to take into consideration the needs of the locality, the nation and sometimes even of the world, so that suitable programmes can be organized based on the market demand. Sometimes leaders have to take the initiative by focusing on certain environmental problems. It is here that they exhibit their true leadership qualities.

Having recognized the essential features of the training of leaders of out-of-school activities, it has been shown that such training can best be achieved by working with the participants on a series of *normal* camps and *special* camps which emphasize planning of activities and management of young people. Furthermore, leaders have to cultivate an aptitude for such work if they are to be successful.

Summary

Out-of-school environmental education programmes in any country have to be supplementary to formal education. The levels at which they are organized must take into consideration the extent to which knowledge and experiences have gone into the formal education at that level. This also implies the level of knowledge in the community (also referred to as *Zeitgeist*).

On the other hand it has been found that out-of-school environmental programmes have enriched formal education at various levels. For example, a series of out-of-school activities on various aspects of pollution formed the background material for inputs into the existing secondary school curriculum in the sciences in Sri Lanka. This has enabled the formal curriculum to be updated.

Development of a needs-based environmental education programme in a country enables the youth to perceive their specific environment with the correct attitudes to such problems as energy, population growth, pollution, conservation and food production. These problems have not been neatly laid out in the various disciplines in schools as they cannot be effectively handled by the traditional teachers alone. Unfortunately, as each day goes by, environmental problems are taking new shape as new forms of technology are being developed. This makes it all the more important that out-of-school environmental education should form an integral part of the future planning of education in any country.

Select references

1. *Youth and environment: Green Revolution, Unesco, ICC, Asian Youth Science Camp, Thondaimanaru, Sri Lanka.* Calcutta, ICC, Asian Secretariat, 1974.
2. Atputhanathan, M. and P. Sabaratnam. "Impact of the research programme on science education", *Bulletin I of the Hydrobiological Survey of Thondaimanaru Lagoon.* December 1967.
3. Wattier, Francis L. "ICC and extra-curricular science in Asia", *ICC Asian Popular Journal.* Calcutta, 1972.
4. Atputhanathan, M. "Education for community development", *ICC, Asian Popular Journal.* Calcutta, 1972.
5. _______. "Out-of-school activity as a supplementary structure to formal education in Sri Lanka—four experiments", *Journal of Education.* Colombo, Ministry of Education, 1980.
6. King, Arthur R. (Jr.) and John A. Bownell. *A theory of curriculum which affirms the centrality of the communities of discourses, approaches in curriculum.* New Jersey, Prentice Hall, 1973. p. 88–100.
7. *Project work in Higher National Certificate of Education classes.* Colombo, Curriculum Development Centre, Ministry of Education, 1976.
8. Wattier, Francis L. *ICC, Unesco, Asian Regional Seminar on Out-of-school Activities in Science and Technology.* New Delhi, 1970.

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USE OF THE MASS MEDIA IN ENVIRONMENTAL EDUCATION: JAPAN'S EXPERIENCE

by Rentaro Ohno

Environmental education in Japan

The concepts, objectives and content of environmental education have gradually been identified and made clear through a series of international meetings. As a consequence, the scope of environmental education is considered to extend beyond the scope of both education on preservation of the natural environment and education on environmental pollution which was started as a result of the need to control environmental pollution problems. The emphasis of environmental education is now laid on the study of human behaviour and the search for harmony between the bio-physical and man-made environments.

These international issues have been reflected in environmental education in Japan, where it has developed from three sources: (i) from education on pollution, (ii) from education on nature or on protection of the natural environment, and (iii) from environmental science. Common concepts have been formed gradually within these three approaches and they are now being integrated one with another.

Environmental education is carried out with and without intent, not only as a part of school education but also in the various educational settings in Japan. It has been taken up in the learning of subjects such as social studies, science, physical education, industrial arts and homemaking and during the period for moral education and special activities.

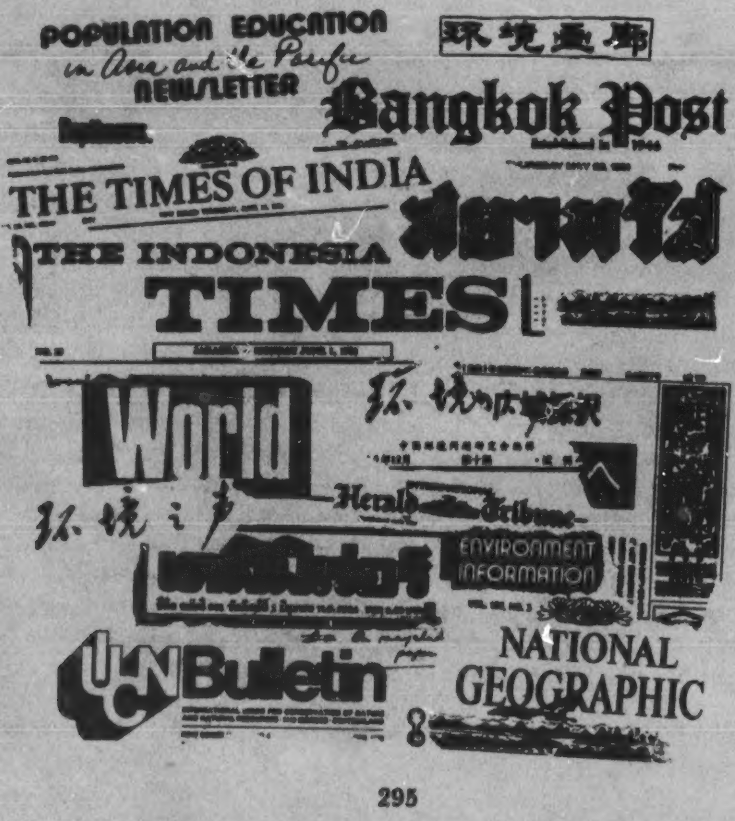
In addition, the period for special curricular activities which has been introduced in the recently revised Course of Study is used for the study of interrelationships between man and the natural environment by taking up special study themes in view of the importance of environmental education. Apart from school education, the use of museums, public parks, Children's Nature Study Centres and Youth Houses provides important opportunities for environmental education. The aims of environmental education are to acquaint students with the natural environment and to develop a positive attitude to its protection and preservation, and the use of such institutions has a significant meaning in pursuing these aims. An increasing number of citizens' public halls in various parts of Japan offer special courses to the general public for the study of problems and issues relating to the environment and resources.

Use of the mass media

The formation and development of environmental education was started in the 1970s. Because environmental education has had so little time to develop, there has been an urgent need to make full use of mass media for the dissemination of information which encourages people to consider the relationships between man and the environment.

In implementing environmental education effectively, the use of various media, especially the mass media, such as television (TV), radio and motion pictures in addition to *newspapers, magazines, books and pamphlets,* is inevitable. There are two ways to utilize the mass media.

The first one is the *planned production of instructional materials and programmes for environmental education* using mass media; the second is the use of many materials and programmes not specifically meant for environmental education, but which are very effective in providing opportunities to *make people think about relationships between man and the natural environment.*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Development of instructional materials using mass media

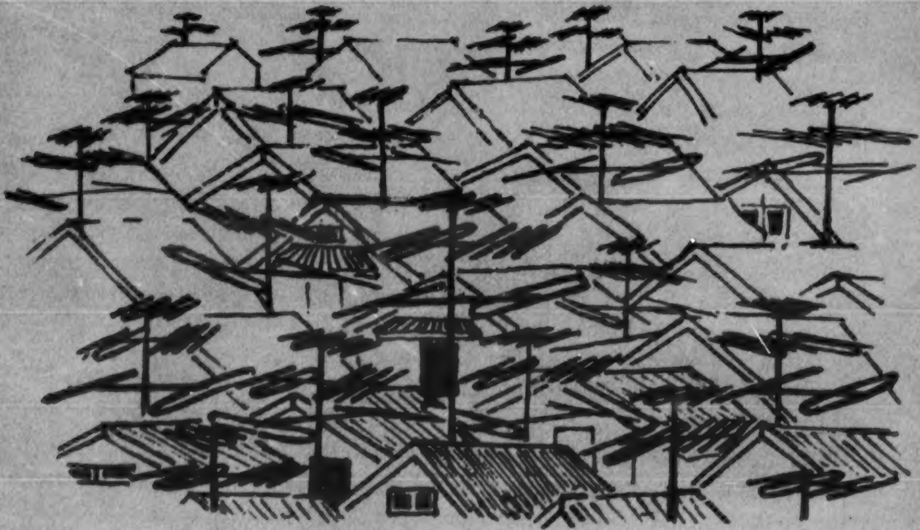
In the 1971 revision of the National Course of Study, the study of environmental pollution in the social studies was included and social studies textbooks were revised accordingly. Since then, instructional materials production comparisons have initiated the development of instructional materials for the study of environmental pollution using such audio-visual media as television, radio, motion pictures, slides and photographs.

In Japan, the rapid industrial development in the 1950s and 1960s resulted in environmental degradation in various parts of the country. There followed a public expression of concern for the need of preserving and protecting the natural environment, and for securing the life of the people. In 1967, the Fundamental Law for Anti-Pollution Measures was promulgated. The revision of the Course of Study in 1971 was made under such circumstances and the development of instructional materials for the study of environmental education was initiated. One of the characteristics of audio-visual media is the high degree of realism they are capable of portraying, so their use is quite effective in showing the actual situation of environmental pollution.

Use of television. With the introduction of the concept of environmental education and the crystallization of its objectives and content, the development of instructional materials for environmental education began differently from education for environmental pollution. One example is the production of school broadcasting programmes for environmental education using educational television. This was done by the Nippon Hoso Kyokai (NHK: Japan Broadcasting Corporation), the nation-wide non-commercial public service broadcasting organization. Since 1975, a programme called 'the Green Earth' has been broadcast to lower-secondary school students, but the content is so well-organized that it can be understood even by the pupils of upper grades in the primary schools. This programme is designed to make direct use of the learning in social studies and science and makes wider use of various learning activities. The annual programme schedule is described in the guidebook for teachers.

In 1980, 'The Green Earth' was a series of programmes, dealing with three aspects; (1) Man and nature; (2) Environment and daily life; and (3) Methods for studying the local environment. The first part describes the biological environment with such topics as Micro-organisms in the Soil and Plankton in the Sea. These attempt to give the students another look at the environment from the point of view of ecology.

In the second area concerning the Environment and Daily Life, environmental problems are handled through programmes about the Polluted Ocean and the like. Programmes in the third part are produced to enhance the motivation of the students to study the environment around them and to explore its mechanism. This series tries to consider environmental education from a



wider ecological perspective than education for environmental pollution. It is noteworthy that the use of audio-visual materials is quite effective as it makes it possible to present the world of the biological environment freely in terms of time and space.

The 'Green Earth', broadcast every fortnight, consists of 20 programmes per year, and is repeated three times. In recent years, many schools have recorded the programmes on video tapes to be used in conjunction with classroom lessons. Attempts have been made to encourage parents to watch the programme together with children at home to stimulate conversation on various topics between the parents and children. In addition to this, an increasing number of citizens' public halls are now using pre-recorded programmes for the study of environmental education.

Use of motion pictures. Environmental education through motion pictures is becoming popular in Japan. The Japan Environment Association, established in 1977 as an extra-departmental body of the government's environment agency, produced nine 16mm motion pictures for environmental education between 1978 and 1980. One copy of these films is distributed free to each prefectural board of education throughout the country, and kept at its film library for use by schools and boards of education upon request.

'Green Partner', 'Forests and Man', 'Mechanism of Nature' and 'Looking up at Mt. Fuji' are films which have been produced. Most deal with the importance and necessity of preserving the natural environment and the ecological system of the environment. The Japan Economic Education

Centre has also produced since the late 1970s such motion pictures as 'The Precious Earth', 'This Beautiful Land' (dealing with the natural environment of Japan and the earth), 'Resources: Past—Present—Future' and 'The Thing Which Supports 110 Million People' (dealing with the effective use of resources). All are distributed free to each prefectural board of education.

Use of other media and materials. For the implementation and promotion of environmental education, it is necessary to compile statistical data, maps or reference materials to show the present state of environmental problems which enable teachers to deepen their study and to prepare their lessons. Major newspaper offices and publishing companies issue yearbooks and reference documents for children in which important data and materials for consideration of environmental problems are included. Some schools purchase several copies of such publications and keep them in the school library for use by the pupils.

Since 1979 the Japan Environment Association has published the 'Environment White Paper through Visual Presentation' for students in lower- and upper-secondary schools and distributed it free to every school in the country. In addition, since 1977, it has published 'Environment Series' as reference materials for young people in primary, lower-secondary and upper-secondary schools, which take up and explain specific environmental problems and make the students think about them. It is published in 200,000 copies and distributed free to the schools.

Besides the production of films, the Japan Environment Association has produced one picture story show every year since 1978 which deals with the discipline required for children at the kindergarten level, such as in cleaning of their surroundings. These are distributed free to each prefectural board of education.

The Japan Economic Education Centre also publishes a teacher's guide for the consideration of economic problems in Japan. It deals with subjects such as the limitation of resources and problems in energy development, and is used by teachers for the preparation of lessons.

It is a unique feature of environmental education in Japan that such public service organizations as NHK, the Japan Environment Association and the Japan Economic Education Centre are committed to developing instructional materials.

The role of mass media in environmental education

In addition to the development and use of instructional materials for environmental education, there is another function of mass media which is not directly intended for environmental education, but which serves to stimulate thinking on the relationships between man and the environment.

NHK has broadcast a programme entitled 'Nature Album' regularly since around 1952, systematically depicting the wildlife of Japan during the four seasons. This 15-minute programme is broadcast every Sunday morning. NHK has local stations in various parts of Japan which enable it to undertake long sessions of outdoor filming to present the beauty, grandeur and wonder of the natural environment. These programmes arouse people's concern for the protection and preservation of the natural environment. Their content has been compiled in the form of illustrated magazines and published by an affiliated organization.

Commercial broadcasting organizations also broadcast many programmes containing valuable records of nature based upon long sessions of outdoor televising both in and outside Japan.

The following can be considered as basic concepts which should be learnt by children as well as adults through environmental education:

1. Living things, *including human beings*, exist on the basis of interdependency with their environment.
2. Living things require food and energy to maintain life.

In the learning and mastery of such basic concepts, documentary films and programmes are considered to be quite effective. In Japan, various motion pictures dealing with the natural environment are produced by commercial film production companies and are distributed to film libraries. They are used as valuable resources for environmental education.

NHK as well as commercial broadcasting organizations broadcast special programmes dealing with the problems of environmental pollution, resources and energy on occasion for the general public.

It is important to inform all people through the mass media that the present world relies on limited resources and that the capacity of the environment to support life is limited. In this respect, it will be necessary to keep on producing more programmes and materials dealing with environmental problems in the future, and national and commercial television and radio broadcasting organizations as well as magazine and newspaper publishing companies have a vital and formidable task in this undertaking. □

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IMPROVING WORKING CONDITIONS AND THE ENVIRONMENT IN THE PROCESS OF INDUSTRIALIZATION

by S.E.G. Perera

Introduction

There is a time-honoured tendency to equate economic development with industrialization. At the same time a popular belief exists that manufacturing industries have the capacity to provide a vast array of job opportunities as well as greatly improved standards of living. Understandably, developing countries in Asia seem to have been influenced by these ideas in evolving their development strategies. As a result, sizeable investments have been made, particularly in the past two or three decades, not only in the establishment of industries but also in introducing some degree of industrialization in rural agriculture.

The passage of time has shown that many countries are experiencing problems which had not occurred to them earlier. These have even tended to retard the development process. For instance, the governments expected industrialization to help solve rising unemployment. On the contrary, the development of industries has led to rural-urban migration which has, in turn, exacerbated the unemployment problem. Low productivity, uncontrolled industrial pollution and environmental degradation as well as the severity of the impact of poor working conditions and environment on the safety, health and well-being of large numbers of workers have all given cause for serious concern in every country. Such enigmatic problems, coupled with continuing inflation and balance of payments difficulties, have resulted in considerable thought being given before launching further industries.

It is increasingly being recognized that development is multi-faceted in nature. Furthermore, an integrated approach which takes into account, among other matters, the interrelationship between development, population problems including migration, natural resources and the total environment—which includes the working environment—is a *sine qua non* to progress. While accepting that a strong case exists for industrialization to the extent that it befits a developing economy, the process should pay due regard to people, for whom such development is eventually meant; to their requirements, their physical and psychological abilities and the environment around them.

Precedence of the social factor over the economic factor

Too often policies have tended to be oriented towards reaping the best economic returns on investment. Arguments have frequently been levelled against the questionable costliness of paying heed to working conditions and the working environment. If good sense had prevailed, however, no one would have overlooked the lessons learnt the hard way by some of the industrialized countries many decades ago when they went through their own industrialization processes. At that time economic circumstances compelled people to work under conditions which paid little or no regard to health, safety, comfort or human dignity. Working people and their families were crammed into accommodation provided by factory, mill and mine. Rest was minimal, with factory hands working 70 to 80 hours a week.

The demand for improvements started with a reduction to a 10-hour day, then nine and later eight hours, permitting adequate rest. Many a time realization had dawned too late that "the social factor must take precedence over the economic factor."[1] Gradually, legislation came to be introduced and standards established, a process which is continuing. Asian developing countries should draw widely from such experiences.

Union behaviour. It stands to reason that in Asia too, workers' unions are best suited to looking after the interests of workers. In industrialized countries which have a long tradition of responsible trade unionism, unions do, in fact, fulfil this role admirably. Often well educated and almost always well informed, they are trained to be watchful not only in regard to wages and other economic benefits but equally to the safety, health and well-being of their fellow-men.

Judging from personal discussions with union officials as well as a perusal of negotiated collective bargaining agreements made in developing countries in the region, one cannot help feeling that unless a planned, purposeful, educational effort is made it will take a long time before unions in developing countries begin to realize the value of improving working conditions and environment so as to champion the cause of the worker across the negotiating table. Nearly always, their emphasis has been on economic demands alone. This could be understood in the context of the absence of bare necessities of life in certain sectors of employment. It is difficult to appreciate, however, their insistence on monetary gains to the exclusion of humane working conditions other than through ignorance of the gravity of the impact of such conditions, especially on the health of workers.

While a trade union in the developed world would bargain for a short working week or flexible working hours, the priorities of its counterpart in the developing countries in Asia would, on the contrary, be for more overtime or Sunday work and of course higher overtime rates and Sunday pay. More recently, however, in two developing countries national trade unions have established divisions devoted to the amelioration of working conditions and the work environment.

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[1] Albert Thomas, *The ILO—The first decade*, 1931.

Employer attitudes. Employers in industrialized countries are much more alert nowadays and may even go out of their way to win the confidence of their unions and maintain their prestige as well as the company's image by paying attention to working conditions and environment. For a long time, these have been matters of less importance to employers in developing countries in the region with few exceptions such as, for instance, in the odd transnational company.

The last few years have, however, witnessed an awakening of interest in these matters in a few employers' organizations. While these are steps in the right direction, much greater educational efforts seem to be needed before employers can develop more progressive attitudes and trade unions can exert their influence effectively on the rank and file at the enterprise level.

Visits to industrial enterprises in developing countries would reveal the vast amount of foreign exchange invested by governments and individual entrepreneurs in the purchase of expensive, sophisticated machinery and equipment. Utmost care is given to the maintenance of these machines in private companies, but the working conditions and environment would not suggest that the man or woman behind the machine is given the attention they deserve. Long hours of work, inconsiderate shift and night work, inconvenient shift rotations, heavy workloads, excessive fatigue, hot and humid atmosphere, dirty and noisy working conditions—complete with air-borne pollutants such as dust, noxious gases and unpleasant smells—and, sometimes, a poor fit of person to machine are part of the lot of a worker on minimal pay.

Working time

It is appropriate to consider initially some aspects of conditions of work which are relevant to the region. Foremost among them is working time. Yet possibly the least attention seems to be paid to the proper organization of working time. Detailed surveys on working time were carried out in two developing countries in the region a couple of years ago. They involved visits to nearly a hundred enterprises spread through the length and breadth of each country. It was disappointing to see how light-heartedly some managements looked upon a matter such as the arrangement of working time.

In an endeavour to ascertain the raison d'etre behind the existing hours of work, questions always asked were how the particular working hours came to be fixed, how long those hours have been in operation and what the previous working hours were. More than half could not provide answers, suggesting that the working times of those enterprises had been fixed arbitrarily.

It is little wonder that absenteeism was high and punctuality low. More than another third of the factories visited had blindly adopted the working times observed by neighbouring factories. In almost all of these companies working hours had not been changed at all for 20 years even though there were problems traceable to inappropriate working hours, suggesting that changes for the better were desirable.

In a smaller number of factories, managements had been more enterprising and their actions had paid dividends. Working hours had sometimes been altered when a management saw the need for a change, yielding results. One textile mill working on three shifts had fortnightly shift rotations. Absenteeism was high, particularly in the morning shift. Questioning of informal groups had led to the suspicion that a fair number of workers were 'moonlighting' (working at second jobs). The change to a weekly rotation coupled with additional cash incentives for good attendance improved the situation, but the change to a three-day rotation combined with free meals brought about the desired result. In another factory, in close proximity to the former, a similar problem had been brought under control somewhat faster and as effectively, by providing different types of incentives; changing the hours of work and reducing the shift rotation from two weeks to *three days.*

A unionized engineering establishment in an urban area in a different country had three shifts and weekly rotations. The problem of high absenteeism was tackled in a completely different manner. Consultations with the union revealed the causes for high absenteeism. The workers involved were exclusively men. Their wives were employed elsewhere. Almost all of them had young school-going children. Not being able to afford servants, the husband and wife would take turns to accompany the children to school. *Weekly* shift changes made it difficult for the wife and husband to adjust themselves to take the children to school. As a result, the children could not attend school on some days, thus giving rise to domestic problems. The effects of this were frequent absences from work, pay-cuts and further problems. Hence, at the specific request of the workers, through their union, followed by discussions between labour and management, it was agreed that shifts would be rotated every *three months.* Without any further incentives, absenteeism dropped almost immediately to a low level never before experienced. These examples of changes in working hours illustrate how both labour and management can gain if alterations are effected after consideration of all aspects of the matter.

Flexitime. A more recent system of working hours is known as 'flexitime'. It is used mostly for white-collar workers. Very briefly, in this system a worker is permitted to start work at a time convenient to him and stop work after completing the number of hours constituting a normal working day. But he is expected to be in attendance during the core hours or busiest time of the day to ensure that the efficiency of the office is not impaired by the absence of any employee.

According to an article in the Social and Labour Bulletin at an engineering workplace in the Soviet Union, a 10 per cent loss of working time caused through absenteeism was substantially reduced after the introduction of flexitime. Apparently, employees arrived late for work or took time off work to attend to personal problems or because of inadequacies in the transport system or because of inconvenient working times for certain categories. These gave rise to excess stress and a general deterioration in the psychological atmosphere followed. The introduction of flexitime reduced stress and improved workers' motivation: absenteeism was reduced by 90 per cent, applications for sick leave declined and overall productivity increased by about five per cent.[2]

Flexitime is spreading in industrialized countries because of its convenience to workers and its usefulness to management. In a number of developing countries, a similar suggestion has been made but there is no evidence yet of its acceptance. Although not referred to as working on flexitime, however, piece-rate workers are sometimes permitted to complete their daily tasks in their own time. Its chief attraction is that it gives the worker freedom to use his time wisely while carrying out the work of the enterprise.

Organization of work. Another aspect of working conditions also built on a form of democratization of the workforce is referred to as 'organization of work', though essentially it is a reorganization of work. This has not yet been accepted fully in developing countries. In this region, it is used in Japan and Australia and some experimentation is in progress in certain parts of India.

Its biggest significance is that it is in consonance with 'humanization of work'. It de-bureaucratizes work systems such as assembly lines and reorganizes work in an autonomous working group or on a team-work basis using popular techniques such as job rotation, job enlargement and job enrichment. The group takes full responsibility for the use of technology as an instrument of production to maintain standards and production schedules.

There is reason to think that this can be of major significance in Asian developing countries where feelings of kinship and family ties are quite strong. It would be worthwhile to adapt imported technology to local cultural values using the principles of organization of work to improve efficiency and increase productivity, essential to the national interest of any country.

Application of ergonomics

While on the subject of technology, mention should be made of the frequent failure of developing countries to make proper choices of technology. This has led to a series of permanent problems in enterprises and even in

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2. International Labour Organisation, Geneva, *Social and Labour Bulletin* 3:321, 1980.

agriculture. The ignorance, seemingly, of the basic principles of ergonomics has resulted in the import of machinery and equipment totally unsuited to the anthropometric measurements of workers. To illustrate the point, a worker was seen to struggle as he drove a tractor on a rice field. On closer examination it was revealed that his discomfort was caused by a poor fit of man to machine. The small Asian had a cushion 9 inches (23 cm) thick on his seat as he rode an International Harvester meant for a tall American. The author was informed that several such drivers gave up driving after they developed a 'low back pain'.

This is not peculiar to one country. A dozen other examples can be given from several countries in the region. In a textile mill in another country, a wooden platform 9 inches high had been constructed between rows of roving machines. On inquiry about the necessity for this unusual structure, the production manager said that it was made to compensate for the short stature of the female machine tenders. As the platform aged and holed, workers fell and injured themselves. In another textile mill in the same country, sets of ring spinning machines had been sunk 6 inches below the floor level for the same reason. In this case, the maintenance men complained that the backs of their hands were regularly scraped. But if planners had known that textile machines are 'one-offs' and can be ordered to fit the height of the people who operate them, the workers would not have been hurt and productivity would have been higher.

Environmental impact

There is ample evidence of other aspects of industrialization which have been much more damaging to mankind. A host of industrial activities have given rise to discharges into and disturbance of the environment at large. Discharges have polluted the atmosphere, inland, marine and subterranean waterways and the land. Disturbances include noise and vibration, heat, radiation, chemical pollution and even the loss of visual amenity. The effects of these discharges and disturbances are colossal and perhaps as yet unknown and underestimated. Assessments have been made of some direct impacts on human health. But the indirect ill-effects on fauna, flora, soils, ecosystems and climates exposed to them are yet to be determined in full.

In addition, activities within industry have had a severe effect on workers in developing countries by causing loss of life or limb or severe impairment of health, which is still taking place. The failure of developing countries to provide strong controlling legislation and then enforce it has contributed to this pathetic state of affairs.

Inadequacies in legislation

Virtually every country which is industrializing has introduced some form of legislation, usually pertaining to work in factories. The laws were

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borrowed largely from the West, often from the United Kingdom. In the space of these two to three decades, however, the factory laws in the West have been continually updated in keeping with new requirements while those in Asian countries have remained more or less unchanged. Worse still, even in that state, the laws are not fully implemented. Often they are inoperative because the regulations pertaining to them have not been framed. Worst of all, the absence of sufficient numbers of trained inspectors is continuously inhibiting the enforcement of existing legislation.

Developing countries are already witnessing the adverse impact of working conditions such as noise and dust as well as the exposure to certain toxic chemicals which are in regular use, but no developing country has established standards in this regard. The failure of legislation to keep step with industrialization is a drawback, and is bound to have a severe impact on industrial workers exposed to hazards unless remedial measures are taken to fill the gaps.

Medical problems. Another significant drawback in some countries is the absence of proper medical services. There is no pre-employment medical examination, as in industrialized countries, to check the suitability of the worker to the specific industrial activity in which he will be employed. There are no medical checks during employment, except perhaps for curative purposes.

Another moral issue generally overlooked in Asia is that it is unfair for employers to expose workers to hazards without telling them so. To give just one example, a regulation in Sweden stipulates that only persons who have acquired the requisite knowledge of the risks involved may work with isocyanates. They must undergo certain basic and periodical medical checks during their tenure of employment.[3] Isocyanates are reportedly in use in most Asian countries and the workers are ignorant of the danger until the hazard manifests itself, and perhaps still even then. This is evidence of the advancements in terms of working conditions and the environment in Sweden, and tends to show how far behind Asian legislation is—although they both dabble with the same chemicals and expose their workers to the same hazards.

Occupational diseases. In Asia the slightest cut or bruise is recorded as an accident in the books maintained in factories and workplaces in terms of the law. But whenever the question is raised about occupational diseases, invariably the answer is that they do not occur. It is strange but true that even in certain enterprises where workers are known to suffer from loss of hearing capacity, lung complaints, low back pain and other problems which may be directly attributable to the working conditions, the records do not show any evidence of occupational diseases.

Company doctor. At least in part this is due to the fact that the company doctor or doctors in hospitals where patients from industrial workplaces

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[3] National Board of Occupational Safety and Health. *Sweden Newsletter* (2): 4, October 1980.

All three photos were taken at a foundry.

Indoor overhead crane. The working environment shows bad housekeeping, often the cause of industrial accidents. Some sense of discipline and habit only are necessary.

Outdoor crane. The working environment needs better arrangement. The cloth cap worn by the worker should be replaced by a steel helmet in the interest of safety. Considerable co-ordination is necessary between the two men to avoid accidents.

Furnace. The door opens automatically and pours molten iron into moulds. A worker watching is exposed to excessive heat and does not wear a uniform to suit such temperatures. He is wearing a wet cloth mask which will not filter toxic vapours. Considerable improvements are possible at little cost.

take treatment hardly ever visit factories and other workplaces. They have little or no knowledge of the working conditions and environment of the factories in which their patients work.

Many company doctors interviewed by the writer in companies in several Asian countries have told the author that their time is wholly spent on curative rather than preventive work and they do not visit factories, adding that they do not have the time to do so. One cement factory with some 2,000 workers in one country had five doctors attached to the plant. But they all stated that they did not visit the factory since they could not find the time to do so.

Besides, unlike their counterparts in industrialized countries, doctors in Asia are not in the habit of establishing a connection, if any, between the illness from which a worker suffers and his place of work. The absence of such a link often fails to bring to light the true cause of the illness, thereby preventing the development of precautions against recurrences. This would also render the statistical records to be erratic and could deprive the worker from collecting compensation due under the law. There is little doubt, therefore, that serious consideration should be given to changing companies' procedures for the better.

Recently, at a national seminar in one country, a company doctor as well as the head of the government central chest clinic confirmed that there was evidence that workers who joined the company without any history of asthma developed the disease and, within about five years, some had became such chronic asthmatics that they had to be retired from the company. Although doctors confirmed that it was definitely an occupational disease, asthma was not listed as such in the workmen's compensation law in the country, possibly because there was no incidence of such a disease when the law was originally promulgated. This bears out the point made earlier that legislation on industrialization must be kept in constant review.

The author believes that most qualified medical personnel in this region have a high sense of responsibility and will pursue the correct path. Experience has shown that either knowledge is lacking or has gone rusty by non-use. It remains for countries in the region to formulate corrective policies and have them implemented. Employers, workers and their associations should be informed so that they know what to expect of the company doctor. That would better help the health of workers to be safeguarded.

Choice of technology

Another matter for reckoning is the tendency for developing countries to blindly follow the industrialized countries in their choice of technology. Often they wish to modernize their production systems rapidly. But they are hampered by a limited capacity for manufacturing machines themselves, lack

Both photos from a wet-cell battery factory

Molten lead being poured into moulds. For safety wear, the worker has only a pair of short rubber gloves. The rest are ordinary clothes—no safety shoes, no masks, no apron—several hazards involved, both long-term and short-term.

Sulphuric acid flows from plastic tanks into plastic containers through plastic tubing by gravity. Method used is shabby and causes spilling of acid. Acid vapour diffuses into the atmosphere. A number of accidents have resulted.

of skills and lack of capital. They have often to import machinery and the corresponding technology from industrialized countries. It is however essential to ensure that such importation of technology does not lead to 'turn-key' factories which could involve workers in performing longer hours of work, suffering increased fatigue and/or mental stress giving rise to increased occupational hazards and accidents as well as social unrest. Such disruptive efforts of technology have occurred in certain countries and caused widespread dissatisfaction and an underestimation of the social and human impact of technological transfer.

On the other hand, appropriate technology provides tremendous scope for protecting or improving working conditions and environment. Significantly, this potential is no less important for small enterprises and the rural and agricultural sectors than for large-scale modern industry. It is not always easy, however, to define mechanisms that will effectively lead to better choices. One important step is the use of a wide range of training and information programmes drawing on carefully planned factual research into the problems arising in specific industries or economic sectors.

The living environment in relation to work

For legislative, administrative, functional and other reasons, the working environment is often distinguished from the general environment. Biologically this is an artificial distinction. Workers respond to the sum total of the environmental influences to which they are exposed both on and off the job.

Improvements in workers' living environment (in particular their nutrition, housing, transport, health and education) are a pre-requisite for the promotion of better conditions of work. Thus, measures to prevent occupational accidents and diseases or introduce new forms of work organization may fail if, being badly housed, under-nourished or ill, people come to work in poor condition. Measures regarding the living environment should therefore be integrated into a global policy aimed at meeting basic needs.

Neglect of food facilities. Energy is expended by a worker in the performance of work, and such energy has to be replaced by an intake of sufficient quantities of food of nutritive value if he or she is to continue to work unhindered at a good pace. Improvement of nutritional status is thus one of the factors consistent with improving conditions of work and as a result, increasing the capacity for work. Canteens which supply good and wholesome food within the financial reach of workers or at subsidized rates are an essential part of a sound factory or office.

In general, food facilities provided to workers and their families are poor. The value of such benefits is overlooked by managements and, let it be said, not always appreciated by workers themselves. In those circumstances, one cannot blame governments if they do not become very concerned either. Yet the health of workers and their capacity for work is impaired in the absence of proper food. Professor Christensen suggests that low energy content of food might constitute a factor of at least the same importance as heat stress when explaining the low productivity of workers in some tropical countries. He adds that a rationally arranged supply of meals to manual workers would be a decisive factor for production in developing countries.[4]

Housing and transport. Seldom are the needs for housing and transport given sufficient attention although both present major problems especially to low-income workers. When factories are situated outside urban areas, there is an insufficiency of public transport. When they are sited within an urban area, public transport is so crowded that it becomes difficult and dangerous to use it. In either case, transport to and from work is often rife with problems. Hence, due consideration must be paid to ensure that workers do not arrive at the factory gate half exhausted because fatigue reduces their capacity for work and, what is worse, makes them more prone to suffer accidents. The net result would always be a lowering of production as well as labour productivity.

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[4] E.H. Christensen: *Trotthet och pauser.* 1966.

As for housing, very seldom do employers supply accommodation to factory workers. They expect the local authorities to fulfil this need, though it is not unusual to provide housing to other categories of workers such as plantation workers and others in enterprises sited in isolated areas. Dormitory accommodation, though frequently unsatisfactory, is offered by employers in some countries while systems for the grant of loans to offer relief also exist. Yet, all in all, the position is unsatisfactory, and inconveniences caused contribute to the lowering of productivity.

Launching of a new programme

While the foregoing would undoubtedly convey to the reader that the present situation on working conditions and environment in Asian developing countries calls for immediate action it must be mentioned that at the global level working conditions have received serious consideration from the International Labour Organisation (ILO) for many years. Worldwide statistics too show that some five million work accidents occur every year and that both the rate of accidents and severity rate have been increasing. Again, some 60,000 chemicals of unknown toxicity are in regular use while more come into the market every year so rapidly that it is not possible to keep tabs on them. The ILO has been actively concerned with problems of conditions of work and life and occupational safety and health since its inception in 1919 and has adopted a large number of international labour Conventions and Recommendations for them. But it became clear that more vigorous action was necessary to come to grips with the problems. Hence it was decided to give a new orientation and a new impetus to action in the field, and a new International Programme for the Improvement of Working Conditions and Environment (PIACT) was launched in 1976.*

Objective and approach. The general objective of PIACT–making work more human–can be classified under three main headings. It seeks to ensure that:

- work respects the worker's life and health;
- work leaves him free time for rest and leisure;
- work enables him to serve society and achieve self-fulfilment by developing his personal capacities.

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* PIACT is the acronym from the French title *Programme International pour l'Amelioration des Conditions et du milieu de Travail.*

The approach of PIACT to problems of working conditions and environment is new in many ways:

1. It encourages Member States to set up for themselves definite objectives for the improvement of working conditions and environment.
2. It treats problems of working conditions and environment globally, articulating more closely than before the traditionally separate areas of conditions of work and life and occupational safety and health.
3. It views these problems in the wider context of general economic and social policy, especially in their relation to industrial relations and employment policies.
4. It seeks to use in a co-ordinated fashion the different ILO means of action to help Member States attain those objectives. Technical co-operation is one of these means of action, the use of which should be closely related to the use of the others: standard setting, research, tripartite meetings (including especially Industrial Committees), symposia and clearing house functions for dissemination of information.[5]

Which of the above problems are of immediate concern in a given case will obviously differ from country to country. The choice of priorities, objectives and methods of action depends on the level of development, the employment situation, the availability of resources, and other factors pertaining to the country. Since PIACT takes full account of this diversity it has a strong national and regional bias. It has already been accepted in ten developing countries in Asia and as much technical assistance as is feasible is provided to assist them in implementing their own national PIACT programmes.

Multidisciplinarity of the approach. In all cases however, PIACT is centred on the worker and therefore concerns itself with the total impact of poor working conditions and environment on the individual. To elaborate, any task will vary in its 'load' on the worker based on the length and arrangement of the time during which the task is executed, the environmental conditions under which it is performed, the physical and mental content of the task, or the pace of work at which the task is accomplished. Besides, many of the concepts used to measure the effects of workload–such as fatigue, stress, dissatisfaction–are in themselves multidisciplinary concepts requiring measurement along many dimensions. Hence the need to adopt a multidisciplinary point of view in looking at national or regional problems in working conditions and environment, in analysing them and in bringing about improvements. □

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[5] PIACT and Technical Co-operation, Geneva, International Labour Organisation, 1979.

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The Social Sciences in the Man-and-the-Biosphere Programme:

TOWARDS AN UNDERSTANDING OF THE RELATIONSHIPS BETWEEN MAN AND THE ENVIRONMENT

Introduction

Although man's interactions with his environment have continually been undergoing change, it is the increasing scale and rate of change in many cases which is threatening to exceed the present adaptive and carrying capacity of the various natural and socio-cultural systems that collectively constitute what is increasingly being called the *biosphere*. The biosphere has been defined as 'the peripheral envelope of the earth together with its surrounding atmosphere in which living things exist, ranging from the deepest layers of soils and oceans, upwards to the highest levels of the atmosphere in which any form of life—including dormant spores or bacterial or other cells—is present at all naturally.'[1]

Changes occurring in human populations, in the pattern of division of labour, in science and technology, and in the structure of attitudes and objectives of societies, have affected the entire gamut of the relationships between man and the environment.

So remarkable have been the changes in the environment caused not only by natural processes but also as a result of man's intervention, that the plea for 'saving the environment' has attained the status of a slogan. It is necessary to remind ourselves that in our zest for preserving the environment, we must not strangle cultures; this too could be disastrous.

It is in this respect that Man and the Biosphere (MAB) was conceived as an international programme of scientific research aimed at developing the basis within the natural and social sciences for the rational use (management) and conservation of natural resources and for the improvement of the relationship between man and the environment. The diversity of situations and conditions in the biosphere is apparent in the characteristics of natural resources, in the extent and manner of their development, in political and economic systems and in socio-cultural conditions.

MAB is an interdisciplinary programme of research concerned with the interaction between the natural and social sciences in the study of human

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1. *Environmental Conservation* (Geneva, The Foundation for Environmental Conservation) 7(2):89, Summer 1980.

A major source for the material in this article is the publication: *The social sciences in the Man and the Biosphere programme; report on seven seminars held in Asia.* Bangkok, Unesco, 1979. 147 p.

interactions with and within the biosphere. Its field projects are located in different ecological zones throughout the world. Under the MAB programme, scientists from many countries are participating in some 900 research projects which are designed to provide practical information that can be exchanged and applied to specific regions. The research and training programmes being developed help to link ecological principles with economic development.

In essence, MAB research is aimed at predicting the consequences of today's actions on tomorrow's world and at improving the relationship between man and the environment.

Kinds of environment

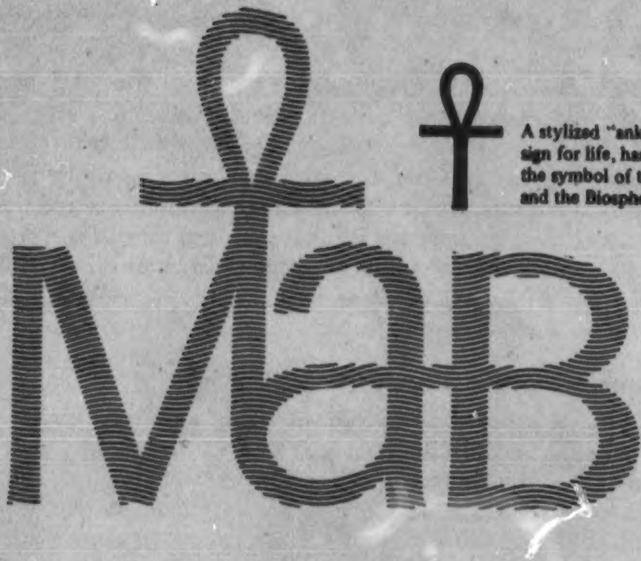
There are three principal notions of the term 'environment' in the context of MAB. These are the natural, physical and perceived environments.

The *natural* environment includes only those components of the biosphere that have originated independently of man, such as the interactions of plants and animals with weather and climate, landforms and soils. These elements in the biosphere are studied by natural scientists as sets of objective phenomena, either in isolation or interacting in ecosystems.

The *physical* environment includes not only these components of the natural environment, but also all the tangible works of man, including cities, transport and communication networks, and other aspects of technology devised for the control and exploitation of the resources of the natural environment. It is useful to distinguish between the man-made components of the physical environment (sometimes termed the 'built' environment) and the natural environment. Both the concepts of natural and physical environment are compatible with a scientific approach towards objectively defined phenomena.

A third notion is that of the *perceived* environment which is defined in terms of human understanding. It is becoming increasingly urgent to recognize that, in their relations to the physical environment (including each other), people deal not with a 'real' world that has the same reality for all others, but instead with a subjectively perceived environment. Research studies have revealed that perception is an important intervening process between man's behavioural intentions on one hand, and the information received from the environment on the other. Thus it may be argued that environmental experiences are first perceived by the individual through his sensory organs before being assimilated into existing cognitive and evaluative structures. Different people have different interests and priorities and view the same slice of the environment with different perspectives.

A cognition of the differing levels of perception among different people is important for the MAB programme because of the link that exists between the nature of the perceived environment and decision-making in that environ-



A stylized "ankh", the ancient Egyptian sign for life, has been incorporated into the symbol of the Programme on Man and the Biosphere (MAB).

ment. Man's existing relationship with the biosphere depends upon the decisions that are being made, and that have been made in the past, about various aspects of use of the environment. In the process of decision-making the values, attitudes and preferences of the individual or of the society are the main variable influences. How the environment is perceived will affect all of these variables.

Ecosystems and human-use systems

While the MAB programme promotes an ecosystem approach to studying the interaction of human populations with segments of the biosphere, the unit for MAB research seldom coincides with a single ecosystem. The social and economic systems through which people manage their environmental resources (human-use systems) often cut across ecological boundaries and, moreover, tend to involve interactions on much larger geographical scales. Indeed, many economic transactions are specifically organized around the exchanges of material, energy and even people between ecosystems.

In the Sahel—where the Sahara Desert is expanding southward—for example, the relevant ecosystems for study by the natural sciences would probably be the grasslands and the desertifying areas, whereas the human-use systems in the Sahel extend *across* such boundaries as a result of seasonal migrations and exchanges between sedentary and pastoral peoples. Similarly, islands are usually studied by the natural sciences through an analysis of the different marine and terrestrial ecosystems. The human use of islands, on the other hand, involves an exploitative relationship between people and several of these ecosystems, and usually also involves interaction between the island and mainland populations.

These multiple systems of human use make up the regional and national entities controlled by governments. An important contribution that the social sciences can make to the MAB programme is therefore to help focus attention on human-use systems in order to achieve co-ordination of the expertise of the natural sciences, which usually refer to small-scale interactions within ecosystems, and the organizational structure through which these ecosystems are exploited, conserved and managed. Such co-ordination is needed both for devising ideas for the rational management of the environment, and for ensuring that these ideas will have a chance of being applied in life.

The rational management of the environment

Two interpretations of the term 'rational behaviour' are relevant. One refers to human behaviour within a specified structure of rules (substantive rationality), and describes the response which will be appropriate if these rules are followed. Classical economics, for example, is founded on the assumption of rational behaviour by decision-makers in a context where maximum profits are considered both desirable and feasible, hence rational. Similarly, the rational management of environmental resources, as conceived in the natural sciences, has been based on the assumption that an ecologically optimum use of resources is both desirable and feasible, and can therefore be defined by the scientist and applied to life.

A second interpretation of rational behaviour (procedural rationality) describes how decisions are actually made. For the psychologist, a person makes a rational decision if he gives appropriate consideration to a problem with which he is faced, in the light of his particular needs and preferences and in the context of his abilities—and acts accordingly. The concept of procedural rationality therefore describes the actual basis for most decisions concerning the exploitation of the environment. Farmers, for example, must draw upon their own experience and knowledge in deriving from their land an adequate livelihood for themselves and their families.

The nature of relationships between man and the environment

There is an increasing urgency for research to be conducted into the changing relationship between man and the environment. Earlier 'subject-object' theories, where the environment was seen as affecting man (or vice-versa) in a uni-directional manner, have given way to recognition of relationships which involve interaction between human-use systems and ecosystems. This represents a movement away from mechanistic and towards progressively more probabilistic approaches, and from unidirectional causality to systems analysis.

Some theorists envisage that the social sciences will eventually move towards the study of 'transactional relationships', where the biosphere is viewed not as something seen through the filter of man's cognitive structure, but instead as something inseparable from it. What constitutes a stimulus, in this context, is always relative to, and defined by, the response. In a transactional relationship, neither party exists except in, and because of, a transaction in which each is engaged.

These processes linking man and the biosphere clearly have both physical and social dimensions, and for them to be properly identified and fully evaluated will require a truly interdisciplinary approach by the investigator. If we restrict our attention to the social sciences, however, we can classify the processes at work into three main types:

1. Processes related to the increasing scale of human-use systems; for instance:
    - reduced efficiency in the use of energy as production becomes more specialized and more energy must be spent on communication, information and organization;
    - emergence of new structures of social responsibility for the management of environmental resources and the maintenance of environmental quality; and
    - increasing conflict in the use of the environment, such as between those who pollute and those who pay for pollution.
2. Processes related to changing perceptions of environment, especially on scales greater than individual sensory perception; for instance:
    - assessment of risk by scientists, administrators and the public as a result of newly-perceived environmental hazards; and
    - value systems, in particular cultural values discretely related to resources, and their modification as traditional societies become integrated with larger social and political entities.
3. Processes related to decision-making by those individuals or collective concerns directly responsible for environmental management or conservation; for instance:
    - processes in society leading to collective action in relation to the resources of the biosphere, such as effective action on pollution, conservation or population growth;
    - social and economic pressures which affect environmental management on a more local scale, such as that by individual farmers or fishermen.

Studying relationships between man and the environment

It is not easy to specify which social science disciplines will provide the necessary expertise for MAB research because many span a wide range of approaches. The best test of suitability is the extent to which work in a particular discipline sheds light on the social dimensions of human interactions with the biosphere. Much relevant theory in this field derives from economics, sociology, demography and environmental psychology, but in relation to the biosphere this theory has been more often applied to other social sciences such as geography, anthropology, human ecology and agricultural economics. These disciplines are often characterized by:

1. A tradition of undertaking empirical studies in the field; and
2. A tradition of working with researchers in cognate natural sciences.

Use of these two criteria will further help to identify social sciences which have the potential to contribute to MAB field projects.

The methods of field work suitable for collecting social science data on relationships between man and the environment include:

1. Historical research, to establish the nature and origins of a particular pattern of cultural adaptation, and thereby to suggest how resilient it may be in the face of changing external forces;
2. Participant observation in particular communities, to establish on the relevant scale, such as in a household or farm, how and why decisions are made concerning the management of the physical environment;
3. Sample surveys to provide basic data on the social and economic characteristics of a random sample of a population or of a group such as important decision-makers. This approach can be adapted to supplying information on environmental perception.[2]

The organization of interdisciplinary research

The MAB projects are the following:

1. Ecological effects of increasing human activities on tropical and sub-tropical forest ecosystems;
2. Ecological effects of different land uses and management practices on temperate and mediterranean forest landscapes;
3. Impact of human activities and land use practices on grazing lands: savanna, grassland (from temperate to arid areas), tundra.
4. Impact of human activities on the dynamics of arid and semi-arid zones ecosystems, with particular attention to the effects of irrigation;

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[2] Whyte, A. *Guidelines for field studies in environmental perception.* Paris, Unesco, 1977. *(MAB Technical notes 5)*

5. Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones;
6. Impact of human activities on mountain and tundra ecosystems;
7. Ecology and rational use of island ecosystems;
8. Conservation of natural areas and of the genetic material they contain;
9. Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystems;
10. Effects on man and his environment of major engineering works;
11. Ecological aspects of energy utilization in urban and industrial systems;
12. Interactions between environmental transformations and the adaptive, demographic and genetic structure of human populations;
13. Perception of environmental quality; and
14. Research on environmental pollution and its effects on the biosphere.

Although MAB research is organized within the framework of these 14 major project areas, this does not mean that particular field projects will necessarily have wide-ranging or largely scientific objectives. Particular research requires a particular aim to be specified, and for MAB research the aim will usually be connected to actual or potential problems of resource management. If a practical problem of this kind is defined, and if the problem is then discussed at an early stage by representatives of both the natural and the social sciences, then it will be easier for the research to be carried out in a spirit of interdisciplinary co-operation. If the research work itself can also be conducted by integrated teams of natural and social scientists who are working towards some goal already agreed upon, then many potential disagreements can be resolved by informed discussion, and overlaps or gaps in research can be more easily avoided.

Instead of this integrated planning, all too often the social sciences are only brought into a project at a late stage in its implementation. As a result, the project's findings tend to be biased towards a natural science view of man and the environment. If this occurs then it becomes difficult to make an effective application of the findings of the research, no matter how intrinsically valuable it may be to the natural science community.

To illustrate the type of role that the social sciences are playing in bringing about a closer understanding of man-environment relationships, the following study on the Upang Delta project in Indonesia is here discussed in some detail.

The Upang Delta Project: Indonesia

In Indonesia, there are 13 million hectares of coastal swamp forests, including estuarine and mangrove forests along shorelines, riparian formations along river banks, and various swamp types further inland. These represent an important potential resource for Indonesian development, but it is an environment where for ecological reasons sustained agricultural use will not be easy. There has been spontaneous pioneer colonization of coastal swamp areas by Bugi farmers since the 1950s, and more recently there has been a planned Government transmigration scheme, settling new colonists from Java and Bali. In this way it was intended that during the 1974–1978 Indonesian Development Plan one million hectares of swamp forest would be converted to agricultural and aquacultural use.

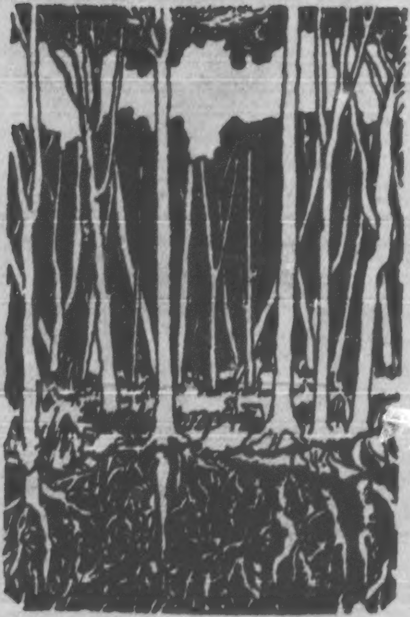
The Upang Delta in south Sumatra has been settled since 1964 by pioneer farmers belonging to various cultural groups, and the area thus represents a large-scale experiment in different approaches to swamp forest management. Bugi colonists were the first to enter the area, and in some ways they have been more successful as farmers than more recent transmigrant settlers from Java and Bali. How this success has been achieved, and whether it can be sustained in the long-term, are unanswered questions. There is evidence that problems such as salt intrusion and decreased soil fertility eventually make some of the swamp rice fields unsuitable for cultivation. Historically, there has been a long-term migration of the Bugi people from depleted or overcrowded swamp areas—as in Kalimantan—to new swamp forests—as in the Upang Delta), and this continuous pioneering may be part of their successful adaptation to a difficult environment.

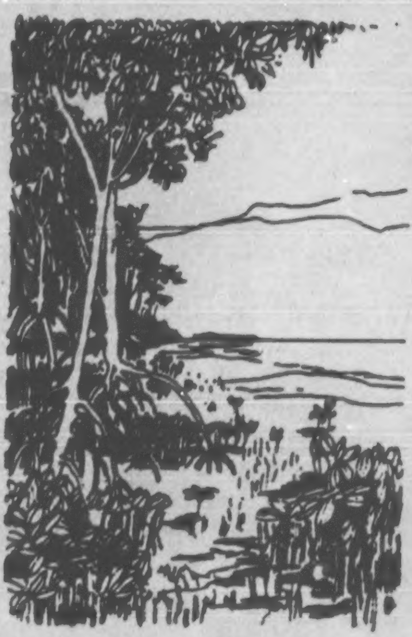
The Indonesian MAB National Committee has therefore initiated a field research programme in the Upang Delta within the framework of MAB Project 1 (Ecological effects of increasing human activities on tropical and subtropical forest ecosystems). This programme aims to answer questions concerning both the environmental and the social aspects of swamp forest management:

1. What have been the ecological effects of the conversion of swamp forest to agricultural land in the Upang Delta? This research objective involves the study of: nutrient cycles in both swamp soils and circulating water; the impact of swamp clearance on local climate, flood control, and the productivity of surrounding areas; associated changes in disease vectors, and hence implications for public health.
2. How do different cultural groups adapt to conditions in the Delta? What features of their cultural adaptation determine the success or failure of their system of environmental management?

Social science contribution

The research programme in the Upang Delta was started in late 1974 and has not yet been fully completed. It is clear, however, that for areas like the Upang Delta an understanding of both the environmental processes and the variety of human responses is an essential basis for planning decisions.





Many of the critical interactions between man and environment in the coastal swamp zone relate to processes of soil formation and water flow. Swamp forest clearance leads to the emergence of a number of potential hazards, including salt intrusion, soil degradation, flooding, seasonal drought and plant pests and diseases. There is, therefore, environmental risk and uncertainty which threaten three aspects of the man-environment relationship:

1. The long-term stability of the ecosystem, with the possibility of rapid geomorphic changes in an area so close to sea-level;
2. The productivity of the human use system, especially if swamp economies are to be based exclusively on wet-rice cultivation rather than a more diversified pattern of resource use; and
3. The stability of human settlement at its present scale.

If these potential problems have been correctly specified, then the important tasks for social sciences research would be:

1. To demonstrate which factors in the social organization, information networks, and land use practices of the different immigrant groups in the Upang Delta contribute to their success as pioneers;
2. Conversely, to identify any factors limiting long-term success, or factors (such as, perhaps, Bugi migration patterns) which make long-term success of lesser perceived importance; and

3. To therefore specify to what extent the existing human use systems in South Sumatra are ecologically 'rational', and in what ways therefore government policy with respect to new transmigrants into swamp forest areas should be modified or expanded.

Conclusion

Concern for the environment, as noted in the MAB research programme, lays its emphasis on local solutions to local problems. There is a general realization among scholars in Third World countries that whatever technology comes into the country it must first and foremost be accepted by the people themselves. As a case in point, farmers in India are fully aware that ploughing the field is better than slash-and-burn agriculture (called swidden cultivation) but the tribals in secluded areas of central India have a taboo against putting a dagger into the heart of mother earth. This illustrates how filtered are man's cognitions and how strong is the process of cultural screening and re-definition. In this case what needs to be studied is the non-logical and non-rational behaviour of man which constitutes a major part of the totality of culture of a given society.

Environmental education for the general public is a natural outgrowth of MAB research. Fortunately, one of the leitmotifs of the MAB programme is the need to involve local populations at different levels and stages of the research process so that they can supply important information based on their experience and knowledge of the local situation.

This involvement of local people in MAB research is important since different people have different levels of perception. As the perception of local people to local environmental problems is often different from that of research scientists, their views need to be taken into account in research planning. Moreover, execution of the research can be facilitated if local people are made to understand that the outcome of the research can be beneficial to them. The successful application of research results will also be enhanced if there is local involvement in and support for the project.

Finally, it must be mentioned that since MAB is an experimental undertaking, it is subject to a higher percentage of failures of individual components than would be expected for a programme conducted along more traditional lines. One thing is certain—international co-operation results in the effective utilization of scarce resources, manpower and financial resources which is, in the long term, advantageous to all countries concerned. Duplication of research studies can be avoided by the sharing of research responsibilities and countries can benefit from the experiences of the others in solving their own environmental problems. □

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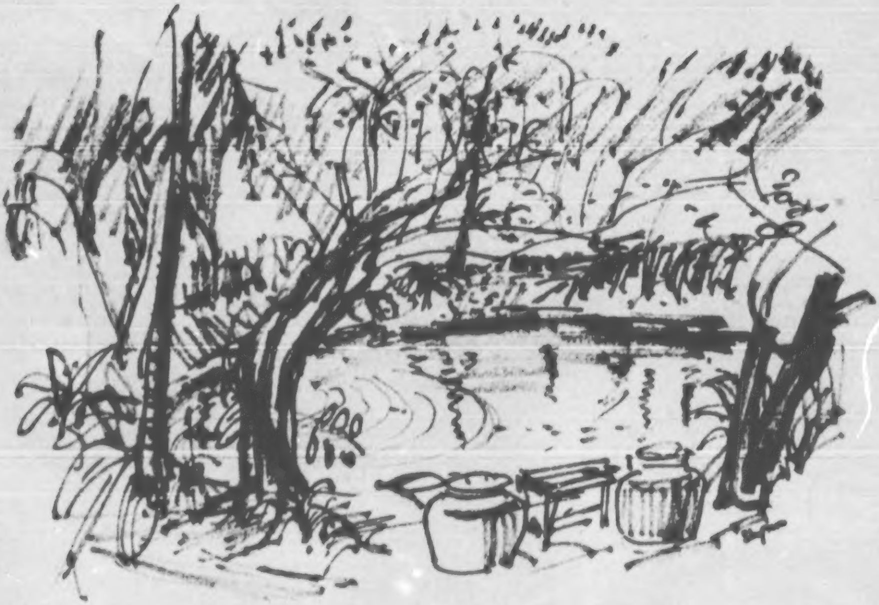
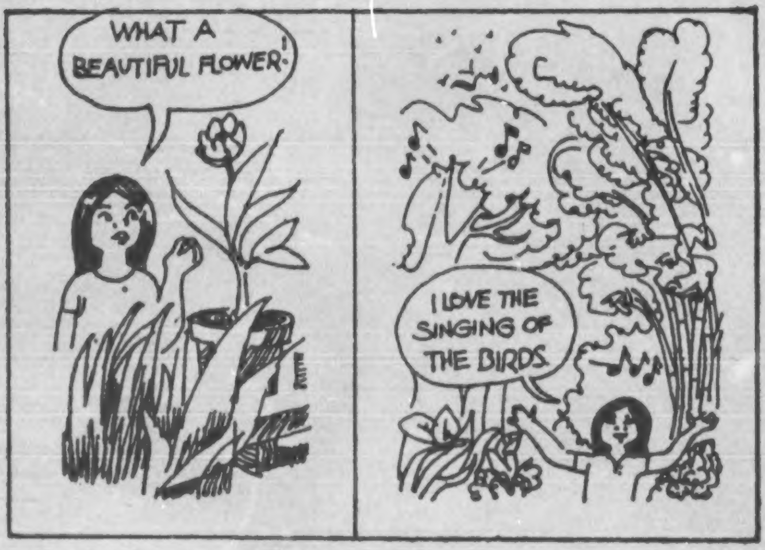
SECTION FOUR

BIBLIOGRAPHICAL SUPPLEMENT




WHAT A BEAUTIFUL FLOWER!
I LOVE THE SINGING OF THE BIRDS.

Source: Philippines. University. Science Education Center. "What can you tell by seeing...by hearing?". Things around us. Manila /Ministry/ of Education and Culture, 1977. p. 16-17. (Elementary school science 1)

Bulletin of the Unesco Regional Office
for Education in Asia and the Pacific
Number 22, June 1981

BIBLIOGRAPHY
ON
ENVIRONMENTAL EDUCATION AND THE ENVIRONMENT

This bibliography is a selection of titles from the holdings and reference lists in the library of the Unesco Regional Office for Education in Asia and the Pacific.

The Educational Documentation and Information Service (EDIS) of the Unesco Regional Office for Education in Asia and the Pacific will appreciate being notified of documents of Asia and the Pacific on and related to environmental education in the region published within the last five years which are not included in the bibliography. Better still, readers may wish to send the actual documents to Unesco EDIS, Bangkok.

ENVIRONMENTAL EDUCATION

Aarons, Audrey and High Hawes with Juliet Gayton, ed. *Child to child,* designed and illustrated by Carol Barker. London, Macmillan, 1979. 104 p. illus.
362.7 AAR

Alles, Jinapala and A. Chiba. "Environmental education at the pre-school and primary level," in *Trends in environmental education.* Paris, Unesco, 1977. p. 81-99
614.707 UNE

Anderson, Randall C. "Introducing the world population crisis in secondary social studies classes: an inquiry-oriented instructional strategy," *Social Education*:27-35, January 1970.
v.f

APEID Mobile Field Operational Seminar on Linking Science Education to the Rural Environment, Philippines and India, 13 August-2 September 1979. *Linking science education to the rural environment - some experiences.* Bangkok, Unesco, 1980. 77 p. (Asian Programme of Educational Innovation for Development).
507 APE

Asian Conference on Multidisciplinary Biology Education Relevant to Community Development, 12-15 December 1978, University of Malaya, Kuala Lumpur. *Curricular aspects in multidisciplinary biology education in Malaysia relevant to community development* [paper presented] by M.P. Praphakar. Kuala Lumpur, 1978. 22 p. mimeo.
614.7 ASI

A library call number follows each entry and should be quoted in any inquiry. Where no call number appears, the title has been borrowed by the library and is not yet available.

Bibliographical supplement

Asian Regional Conference on School Biology, 2nd, Tokyo, 11-17 August 1968. *Proceedings:*

- Discussion groups:

  Group II - *Ecology in Asia; land resources;*
  Group III - *Ecology in Asia; its marine resources,* p. 311-314;
  Group IV - *On the teaching of conservation of natural resources,* p. 319-321.

- *Terrestrial ecology of tropical Asia - Implications for biological education,* by William V. Mayer and Victor Larsen, p. 15-23.

574.07 ASI

Asian Regional Conference on School Biology, 3rd., Manila, 28 December 1970-2 January 1971. *Proceedings:*

- *Study of pollution as a student research project,* by Choon M. Kim, p. 53-58.

574.07 ASI

Asian Regional Conference in Biological Education, 4th, Jerusalem, 13-18 August 1972. *Proceedings:*

- *Evaluation of teachers and learning environments with respect to elementary school science,* by Wynne Harlen. p. 107-117

574.07 ASI

Asian Regional Conference in Biological Education, 6th, Bangkok, 28 July-2 August 1976. *Proceedings:*

- *Science education and ecology of Thailand,* by Jack L. Carter, p. 113-115.

574.07 ASI

Asian Workshop on Environmental Education, Bhopal, Regional College of Education, 10-16 August 1978. *Pilot project in environmental education in Madhya Pradesh; report.* Bhopal, Regional College of Education, 1978. 46 p.

614.7 ASI

Australia. Curriculum Development Centre, Canberra. *A report on the Belgrade Workshop on Environmental Education, Unesco-UNEP Environmental Education Programme, Belgrade, 13-22 October 1975,* by Peter J. Fensham. Canberra, 1975. 26 p.

614.707 CUR

Australian National Commission for Unesco. /Seminar, Melbourne, 26-30 May 1975/ *Education and the human environment, final report,* ed. by Russel D. Linke. Canberra, 1976. 402 p.

614.7 AUS

Baer, Richard A., Jr. "Our need to control: implications for environmental education," *The American Biology Teacher* 38(8):473-476, November 1976.

v.f.

Barr, John. *The environmental handbook: action guide for the UK.* London, Ballantine/Friends of the Earth Book, in association with Pan Books Ltd., /c1971/ 333 p.

614.7 BAR

Barrow, L.H. "Real problem solving in environmental education," *American Biology Teacher* 41:560-561, December 1979.

v.f.

Bennett, Dean B. *The evaluation of environmental education learning, state of the art paper on environmental education [for] International Workshop on Environmental Education, Belgrade, Yugoslavia, 13-22 October 1975.* Paris, Unesco, 1975. 27 p. draft mimeo. (ED-75/CONF. 001/13)

614.707 BEN

Blum, A. "Environmental science education programs in and outside the United States," *International Review of Education* 26(1):76-79, 1980.

P

______. "Agriculture as environmental science project...," in *Unesco new trends in integrated science teaching,* v.2. Paris, Unesco, 1973. p. 37-51 (Unesco. *The teaching of basic sciences)*

507 UNE

Boller, Purificacion C. "The urgent need for environmental education," *The Philippine Journal of Education* 54(3):124, 154, August 1975.

P

Bordadyn, Olga. "First countrywide conference on environmental education [Minsk, July 1979]," *Bulletin: Commission of the USSR for Unesco* 37-38 (3-4):36-37, 1979-

P

Brook, Antony. "World-wide support for environmental education, *Unesco Features* (727):8-11, 1978.

P

Bryant, Covey K. and Harold R. Hungerford. "An analysis of strategies for teaching environmental concepts and values clarification in kindergarten," *Journal of Environmental Education* 9(1):44-49, Fall 1977.

P

Bugenyi, F.W.B. "Education in environmental chemistry," *Bulletin of the Regional Office of Science and Technology for Africa* 13(3):15-18, July-September 1978.

P

Buttel, Frederick H. and Donald E. Johnson. "Dimensions of environmental concern: factor structure, correlates, and implications for research," *Journal of Environmental Education* 9(2):49-64, Winter 1977.

P

Carson, S., comp. *Environmental studies: the construction of an 'A' level syllabus.* Slough, Bucks, National Foundation for Educational Research in England and Wales [c1971] 158 p.

614.7 CAR

A case study of teacher training in environmental education in the Philippines, prepared by Leticia P. Cortes. Diliman, Quezon City, Science Education Centre, University of the Philippines, [n.d.] mimeo.

C.F.

Case study on national training workshop on environmental education. [Seoul] Korean National Commission for Unesco, [n.d.] mimeo.

C.F.

Chandra, Ramesh. "Need for environmental education in schools," *PEN Population Education News:* 1-2, 20, June 1978.

P

Chiappo, Leopold. "Environmental education and the third world," *Prospects, Quarterly Review of Education* 8(4):456-465, 1978.

P

Childress, Ronald B. and Jonathan Wert. "Challenges for environmental education planners," *Journal of Environmental Education* 7(4):2-6, Summer 1976. P

Choudhury, M. Kashauzzaman and A.K.M. Obaidullah. *Outdoor primary education in Bangladesh, a study prepared for the International Educational Reporting Service.* Paris, Unesco, 1980. 60 p. (Unesco: IBE Experiments and innovations in education, no. 40) 371.39 UNE

Chowdhry, Mira. *Guideline for environmental education.* New Delhi, NCERT [n.d.] 11 p. mimeo. v.f.

Cimorelle, Anthony. "Students to overcome pollution," *The American Biology Teacher* 37:100-101, 120, February 1975. P v.f.

Conner, Paul E. "Environment, debate as a way to teach environmental issues," *The Science Teacher* 42:49-50, January 1975. v.f.

Cook, J. "Environmental pollution by heavy metals," *The International Journal of Environmental Studies* 9(4):253-266, September 1977. P

Corcoran, Ellen. "Curriculum development for outdoor learning; a model teacher education process," *Journal of Environmental Education* 7(4): 55-61, Summer 1976. P

Delany, M.J. *Environmental education and the developing world, an inaugural lecture.* Bradford, Yorkshire, University of Bradford, 1979. 15 p. v.f.

Disinger, John. "The literature of environmental education," *The Journal of Environmental Education* 10(4):2-3, Summer 1979. P

Doran, Rodney L. "State of the art for measurement and evaluation of environmental objectives," *Journal of Environmental Education* 9(1): 50-63, Fall 1977. P

Du Shane, J. "Experiential education, environmental education, general education: putting it all together," *Journal of Environmental Education* 11:24-30, Winter 1979-80. P

Dunlop, David L. "Energy-environment simulator," *Journal of Environmental Education* 10(4):43-48, Summer 1979. P

"Educating for a better environment," *Prospects, Quarterly Review of Education* 8(4):395-550, 1978. P

Educational Facilities Laboratories, New York. *Environmental education/facility resources; a report from EFL* developed in co-operation with the National Education Association and National Park Service, U.S. Department of Interior. New York, 1972. 63 p. illus. 614.707 EDU

Edwards, Richard. "The Tokashiki experience," *The Journal of Environmental Education* 10(4):12-13, Summer 1979. P.

Environmental Action Coalition. *It's your environment; things to think about, things to do,* illus. by S.H. Binham, ed. by S. Koehler. New York, Charles Scribner's Sons, 1976. 218 p. 301.31 E 61 i

"Environmental education in ASEAN universities," *RIHED Bulletin* 7(3):11, September-December 1980.
P

"Environmental education in Asia and Oceania Region," *Connect* 4(4):1-4, December 1979.
P

Environmental education, the last measure of man; an anthology of papers for the consideration of the 14th and 15th Conferences of the U.S. National Commission for Unesco, Omaha, 6-9 June 1971 [and] Atlanta, 21-24 November 1971 Washington, D.C., United States National Commission for Unesco [n.d.] 188 p.
301.3107 E 61

The environmental problem; selections from hearings on the Environmental Education Act of 1970, ed. by Irving Morrissett and Karen B. Wiley. Boulder, Social Science Education Consortium; and Bethesda, ERIC, 1971. 228 p.
301.31 E 61

"Environmental studies," *The Times (London) Educational Supplement* 3342:37-44, 4 July 1980.
P

ERIC Science, Mathematics, and Environmental Education Information Analysis Centre, Columbus, Ohio. *100 teaching activities in environmental education*, selected and edited by John H. Wheatley and Herbert L. Coon. Columbus, [n.d.] 195 p.
614.7 ERIC

ERIC Science, Mathematics, and Environmental Education Information Analysis Centre (SMEAC). *A review of research related to environmental education*, by Robert E. Roth and Stanley L. Helgeson. Columbus, 1972. 50 p. (*Research review series - Environmental education, paper* 1)
301.3107 E 22 r

Eugenics Society 8th Symposium, London, 1971. *Population and pollution; proceedings*, ed. by Peter R. Cox [and] John Peel. London, Academic Press [1972] x, 163 p.
301.31 E 87 p

Fennessey, Fail M. and others. "Simulation, gaming and conventional instruction in the teaching of ecology," *Journal of Environmental Education* 5(4):21-24, Summer 1974.
P

Fensham, P. *Regional tertiary environmental education.* Canberra, Australian National Commission for Unesco, 1980.
614.7 FEN

Fensham, Peter J. "Stockholm to Tbilisi - the evolution of environmental education," *Prospects, Quarterly Review of Education* 8(4):448-455, 1978.
P

Fisher, Richard B. "The college and the classroom: bringing the two together," *Journal of Environmental Education* 11(2):46-48, Winter 1979/80.
P

Fowler, H. Seymour. "Research in environmental education," *The American Biology Teacher* 37(3):178, March 1975.
v.f.

Gabor, D. and others. *Beyond the age of waste, a report to the Club of Rome*. 2 ed. Oxford, Pergamon, 1980. 265 p.
614.7 GAB

Bibliographical supplement

Garcia, Marcela B. "Children's characteristics and their logical implications for environmental education," *The Modern Teacher* XXVI(1):11-12, June 1978; XXVI(2):63-65, July 1978.
P

______. "The major goal of environmental education," *The Modern Teacher* XXIII(6):356-357, November 1974.
P

Ghose, A.M. *Environmental education; final report [of the Regional Consultant... 14 October 1978-15 August 1979]* Bangkok, Unesco, 1979. 1 v. (various paging) mimeo.
614.7 GHO

______. *Report of a staff mission to Malaysia, Indonesia, Singapore and Philippines, 11 March to 5 April 1979.* Bangkok, Unesco, 1979. 1 v. (various paging) mimeo.
614.7 GHO

______. "Science education through environmental programmes," *ACEID Newsletter* (18):17-18, September 1980.
614.7 GHO

Gillett, Margaret. "Unesco Conference on Environmental Education," *Newsletter (World Council of Comparative Education Societies)* 5(4):17-21, December 1977.
P

Gopal, Brij. "Environmental education in India," *ROSTSCA Bulletin* (12):15-16, June 1980.
P

Greenall, A. *Environmental education for schools or how to [teach] environmental education.* Canberra, Curriculum Development Centre/Department of Science and Environment, 1979.
614.7 GRE

"Guidelines for environmental education," *Unesco Courier* (33rd yr.):23, May 1980.
P

Gupta, B.S. and J.S. Rajput. *Functional aspects of teaching through environment [paper for Asian Workshop on Environmental Education] sponsored by Unesco, WCOTP, C.T.F. and A.I.E.F.E.A., 10-16 August 1978.* 6 p.
v.f.

Hague, M.A. "Environmental studies in the primary school," *Journal of Indian Education* IV(4):33-39, November 1978.
P

Heath, P. and T. Weible. "Citizenship via environmental education: an alternative," *Journal of Environmental Education* 11:38-40, Winter 1979-80.
P

Henning, Daniel H. "In-service training for environmental personnel: a critical analysis with innovations," *Journal of Environmental Education* 11(4):4-10, Summer 1980.
P

Herbst, Robert L. "Environmental education - the unfinished agenda," *Journal of Environmental Education* 11(4):2-3, Summer 1980.
P

Holbrook, J.B. "Environmental integrated science education" *Hong Kong Science Teachers Journal* 6(1):16-21, June 1978.
P

Holgate, Martin W., and Gilbert F. White, ed. *Environmental issues.*, London, John Wiley, 1977. 224 p. (SCOPE Report 10)
614.7 HOL

Coward, Jeanne. "Urban environmental education - what it is, who does it, who should do it, what to read," *Journal of Environmental Education* 11(4):45-48, Summer 1980.
P

Hug, John. "Interdisciplinary environmental courses: a dream or reality?" *School Science and Mathematics* 77:379-401, May 1977.
v.f.

Hungerford, Harold R. and Robert Ben Peyton. *Strategies for developing an environmental education curriculum, a discussion guide for Unesco training workshops on environmental education,* prepared under Unesco contract. Bangkok, 1980. 91 p.
614.707 UNE

Hungerford, Harold R.; Robert Ben Peyton and Richard J. Wilke. "Goals for curriculum development in environmental education," *Journal of Environmental Education* 11(3):42-47, Spring 1980.
P

India. Ministry of Education and Social Welfare. *Developing the curriculum for national adult education programme (NAEP).* New Delhi, 1978. 20 p.
374.954 IND

______. ______. Primary Curriculum Development Cell. "Environmental education," in *Minimum learning continuum.* Delhi, 1979. p. 26-32 (NCERT Publication no. 3)
372.954 IND

______. National Council of Educational Research and Training (NCERT) Department of Education in Science and Mathematics. *Southern Regional Workshop: first phase 8-12 January 1979; second phase 19-23 February 1979.* New Delhi, 1979. 2 v. (All India Environmental Studies Project)
614.707 IND

______. Ministry of Education and Social Welfare. National Council of Educational Research and Training (NCERT). National Institute of Education. *An approach to evaluation in environmental studies at the primary stage.* New Delhi, 1979. 64 p.
614.707 IND

______. Regional College of Education, Bhopal. *Teaching through environment,* ed. by A.B. Saxena, B.S. Gupta and J.S. Rajpur. Bhopal, [1980?] 115 p.
614.707 IND

Indonesian Committee for the Programme on Man and the Biosphere, Jakarta. *Pilot project on environmental education at primary schools in Jakarta; report.* Jakarta, 1980. 33 p.
614.707 IND

"Interdisciplinary environmental education," *The American Biology Teacher* 37:81-82, 128, 130, February 1975.
v.f.

International Conference on Public Education, 31st, Geneva, 1968. *The study of environment in school.* Geneva, International Bureau of Education/Paris, Unesco, 1968. 187 p. (IBE Publication, no. 314) Also available in French: *L'étude du milieu à l'école.*
153.92 INT

International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland. Commission on Education. Working Meeting, Forest Research Institutes and Colleges, Dehra Dun, India, 21-22 November 1969. *Environmental conservation education problems in India; proceedings.* Morges, 1970. 74 p. (IUCN Publications new series. Supplement paper no. 25)
333.7 IUCN

International Working Meeting on Environmental Education in the School Curriculum, Forests Institute for Ocean and Mountain Studies, Carson City, Nevada, 20 June-11 July 1970. *Final report [of the Working Meeting] conducted by IUCN in co-operation with Unesco as part of the International Education Year.* [Carson City] IUCN 1970. 33 p.

333.72 INT

Jawaharlal Nehru University. School of Environmental Science, New Delhi. Workshop on environmental education, 7-8 March 1979. [Report] New Delhi, 1979. 45 p.

614.707 JAW

Jayasuriya, D.C. "Environmental education and the family planner," *Future* 4(1):12-13, 1977.

P

______. "Environmental education - its nature, scope and definition," *Journal of Family Welfare* 35(1):41-47, September 1978.

P; v.f.

______. *Environmental education, population programmes and non-governmental organizations.* [Colombo] Environmental and Population Law Committee, Family Planning Association of Sri Lanka, 1978. 7 p. mimeo.

C.F.

______. *An introduction to environmental education.* Bangkok, Population Education Clearing House, Unesco, 1979. 17 p. mimeo. (*An SDI service for population education*)

v.f.

Johnson, Victor R. Ibikunle. "International co-operation for environmental education," *Prospects, Quarterly Review of Education* VIII(4):515-522, 1978.

P

Kelly, Joseph R. "The concept of environmental education," *The Education Digest:* 9-11, March 1970.

P

Keown, Duane. "A design for teaching a new land ethic to junior high students," *Journal of Environmental Education* 10(4):40-42, Summer 1979.

P

Khosla, Ashok. "Population and environment and their place in education," in India. National Staff College for Educational Planners and Administrators. *Growing multitudes and the search for educational opportunity.* New Delhi, 1975. p. 229-253

301.3206 I39g

King, Jonathan [and others]. *The effectiveness of educational environments: a survey of recent research,* prepared for Unesco, Division of Educational Policy and Planning. Paris. Unesco, 1978. 75 p. mimeo.

371.102 KIN

Knamiller, Gary W. "Environmental education and the third world," *Journal of Environmental Education* 10(4):7-11, Summer 1979.

P

______ and John Obeng-Asamoah. "The child in the community, Ghanaian children's perceptions," *Journal of Environmental Education* 10(4):21-27, Summer 1979.

P

Kuhn, David J. "Study of the attitudes of secondary school students toward energy-related issues," *Science Education* 63(5):609-620, 1979.

v.f.

Kupchella, Charles E. "Essential curriculum components in environmental education," *Journal of Environmental Education* 8(3):11-16, Spring 1977. P

Labianca, Dominick A. "London smog: a topic of interdisciplinary study for the non-science major," *Journal of College Science Teaching* 5(2): 93-94, November 1975. v.f.

Le Nhu Tru, "Instilling the spirit of responsibility in 2d form pupils through tree-caring," *Review of Pedagogical Research* 7th year (35):16-18, January 1975. In Vietnamese.

Levin, James. "Integrating basic skills into environmental education," *The American Biology Teacher* 38(6):357, September 1976. P

Linke, R.D. *Environmental education in Australia: Part I. Final report on a national survey of environmental education in Australia 1973/74 presented to the Australian Advisory Committee on Research and Development in Education.* [Canberra, Australian Government Publishing Service?] 197[illegible]. 614.7 LIN

McCaw, J. "Teacher attitudes toward environmental education," *Journal of Environmental Education* 11:18-23, Winter 1979-80. P

McDonald, Kevin. "Case studies in environmental education," *The Australian Science Teachers Journal* 24(1):5-16, May 1978. P

McInnis, Noel, [and] Don Albrecht., ed. *What makes education environmental?* Louisville, Ky., Data Courier [1975] 470 p. 614.707 MAC

McKay, S. "Project of national significance; work of the Edinburgh based volunteers environmental resources centre," *The Times (London) Educational Supplement* 3342:44, 4 July 1980. P

McTeer, J. Hugh. "Teenage-adult differences in concern for environmental problems," *Journal of Environmental Education* 9(2):20-23, Winter, 1977. P

Madhyastha, U.S. "Environmental approach to the teaching of social studies," *The Primary Teacher* II(3):11-14, July 1977. P

Malaysia. Universiti Pertanian. Faculty of Science and Environmental Studies. *Environmental studies programme.* Serdang Selangor, 1977. 1 v. (various paging) 614.707 MAL

Manuel, Juan. "Educational programmes in environmental protection," *Science Review* 15(5):12-15, September-October 1974. P

Marsh, J.A. "An approach to environmental science for Teachers' College students," *Australian Science Teachers Journal* 21(1):63-68, May 1975. P

Martin, George C. and Keith Wheeler, ed. *Insights into environmental education.* Edinburgh, Oliver and Boyd, 1975. 199 p. 614.707 MAR

Meadows, Dennis and Lewis Perelman. "Limits to growth, a challenge to higher education," in *Prospects Quarterly Review of Education* VII(1): 33-43, 1977. P

Miles, John C. "Humanism and environmental education," *Journal of Environmental Education* 7(3):2-10, Spring 1976- P

_____. "The study of values in environmental education," *Journal of Environmental Education* 9(2):5-17, Winter 1977. P

Miller, G. Tyler, Jr. *Living in the environmental concepts, problems, and alternatives.* Belmont, Cal., Wadsworth Pub. Co., 1975. [593] p. 301.3107 M 6481

Misha, Arun K. *Environmental studies for the primary classes.* New Delhi, NCERT [n.d.] 20 p. mimeo. v.f.

Moroni, Antonio. "Interdisciplinarity and environmental education," *Prospects, Quarterly Review of Education* VIII(4):480-494, 1978. P

Moyer, Richard H. "An investigation of factors influencing environmental attitudes," *School Science and Mathematics* 75:266-269, March 1975. v.f.

National training activities in environmental education," *Connect* 4(2):1-8, June 1979. P

New York. State Education Department. *Handbook of environmental education strategies.* Albany, University of the State of New York, 1972. 21 p. NA P371.32 N566h

Ninth Regional Conference of the North-West Europe Committee. Commission on Education IUCN. Rotterdam, Netherlands, 30 August-5 September 1971. *Environmental education in an urban society, proceedings.* Morge, Switzerland, International Union for Conservation of Nature and Natural Resources, 1972. 105 p. (IUCN Publications new ser. Supplementary paper no. 37) 614.707 REG

Numata, M. ed. *Methodological studies in environmental education - 1978.* Chiba, Chiba University, 1979. 56 p. mimeo. 614.7 NUM

Orais, Felipe S. "What is environmental education? [a poem]," *The Modern Teacher* XXVI(8):404, January 1979. P

Organization for Economic Co-operation and Development (OECD), Paris. *The state of the environment in OECD member countries.* Paris, 1979. 177 p. illus. 614.7 OECD

_____. Centre for Educational Research and Innovation. *Environmental education at post secondary level.* Paris, 1974. 2v. Also in French: *l'enseignement de l'environnement au niveau post-secondaire.* 614.7 ORG

_____. _____. *Environmental education at university level: trends and data.* Paris, 1973. 320 p. Also in French: *l'enseignement de l'environnement au niveau universitaire: reflexions et données.* 614.707 OECD

_____. _____. *Environmental problems and higher education.* Paris, 1976. 182 p. 614.707 OECD

Perrott, Elizabeth. "Environmental education - key issues of the future role of the educator," *Habitat International* 4(1/2):199-205, 1979. P

X

Pettus, Alvin M.; Robert B. Frary and Thomas G. Teates. "The attitudes of science and social studies teachers toward environmental issues," *Journal of Research in Science Teaching* 15(5):367-372, 1978.
v.f.

"Philippines: experiences in developing exemplar teacher education materials for environmental ecology," in *APEID. Designing instructional materials for general education and teacher training: a portfolio of experience in Asia and Oceania.* Bangkok, Unesco, 1980. p. 236-244.
371.3078 APE

Ponniah, Wimala Devi. *Students' attitudes to an inner-city environment (Thesis M.ED.)* Clayton, Vic., Monash University, 1978. 168 p.
614.707 PON

RECSAM Regional Workshop on Environmental Education, Penang, 2-13 August 1976. *Final report,* convened by SEAMEO-Regional Centre for Education in Science and Mathematics. Penang, 1976. 294 p. (RW/EE/76)
614.7 REC

"A report on pilot projects in environmental education," *Connect* 3(2): 1-8, May 1978.
P

Romanor, Vladimir S. "Environmental education and professional training," *Prospects, Quarterly Review of Education* VIII(4):508-514, 1978.
P

Romm, Jeff. *Higher education and natural resources management in Southeast Asia.* Washington, D.C., Overseas Liaison Committee, American Council on Education, 1978. 47 p. (Overseas Liaison Committee paper, no. 13)
614.707 105 ROM

Roth, R.E. "Conceptual development and environmental education", *Journal of Environmental Education* 11:6-9, Fall 1979.
P

______, and Stanley L. Helgeson. *A review of research related to environmental education.* Columbus, Ohio State University, ERIC Information Analysis Centre for Science, Mathematics and Environmental Education, 1972. 50 p. (*Environmental education information reports*)
614.7 ROT

Sachs, Ignacy. "Environment and development - key concepts for a new approach to education," *Prospects, Quarterly Review of Education* VIII(4):439-445, 1978.
P

Salita, Domingo C. "Educational programmes in environmental sciences at the University of the Philippines system," *Science Review* 16(3):10-13, May-June 1975.
P

Santanagopalan, S. "Role of universities in environmental studies," *University News* 15(7):172-173, April 1977.
P

Saveland, Robert N., ed. *Handbook of environmental education, with international case studies.* London, John Wiley, 1976. 267 p. illus.
614.7 SAV

Schafer, R. "Dung heap syndrome and other destructive phenomena detrimental to the progress of environmental education," *Journal of Environmental Education* 11:4-5, Fall 1979.
P

Schlesinger, William H. "Teachers and students write a curriculum on water pollution," *The American Biology Teacher* 33:211-213, 225, April 1971.
v.f.

Seminar on Environmental Education, Wellington, 26-27 November 1976. *Report [of the Seminar]* Wellington, Commission for the Environment, 1976. 1 v. (various paging)
614.7 SEM

Setamanit, Surin. "Thailand national report on environmental training or practising civil engineers," *Journal of Engineering Education in Southeast Asia* 6(7):69-73, April 1976.
P

Seven, Steven M. "Environmental interpretation for the visually impaired," *Journal of Environmental Education* 11(4):37-40, Summer 1980.
P

Sharma, D.V. "Environmental education for adult education functionaries," *Indian Journal of Adult Education* 41(3):3-5, March 1980.
P

Shifferd, Kent D. "The conceptual chaos in environmental studies," *The Journal of Environmental Education* 4(3):58-60, Spring 1973.
P; v.f.

Shoman, J.J. "Tomorrow in environmental education," *Journal of Environmental Education* 11:28-29, Fall 1979.
P

Shordt, Kathleen and J. Ratnaike. *Environmental education in Asia.* [Bangkok, Unesco, 1978] 25 p. (Typescript)
301.3107 S559e

Smyth, J.C. "The biological framework of environmental education," *Journal of Biological Education* II(2):103-108, 1977.
v.f.

Spencer, David and John Lloyd. *A child's eye view... perception studies for environmental education.* Birmingham, Centre for Urban and Regional Studies, University of Birmingham, 1974. 118[49] p. (*Research memorandum* no. 34)
614.707 SPE

Stapp, W. B. "Inservice teacher training in environmental education," *The Science Teacher:*33-35, April 1967
v.f.

______. "An instructional model for environmental education," *Prospects, Quarterly Review of Education* VIII(4):495-507, 1978.
P

______, and J.E. Crowfoot. *Developing a national strategy for E.E., a planning and management process; a working document for environmental education meetings.* Paris, Unesco, 1978.
614.7 STA

Stapp, William B. "International environmental education; developing Unesco's programme," *Journal of Environmental Education* 11:33-37, Fall 1979.
P

______, and J.E. Crowfoot. *Suggestions for developing a national strategy for environmental education - a planning and management process - a discussion guide for Unesco training workshops on environmental education,* prepared under a Unesco contract. Paris, Unesco, 1980. 27 p. (ED-80/WS/135)
614.707 STA

"State of the art for measurement and evaluation of environmental objectives," *Journal of Environmental Education* 9(1):50-63, Fall 1977. P

Steiner, Robert L. "Attitudes of Oregon high school seniors towards some environmentally oriented science-related social issues," *Science Education* 57(4):417-436, 1973. P

Studebaker, Paul. "The justification for environmental education," *The Journal of Environmental Education* 4(4):48-50, Summer 1973. P; v.f.

Swan, James A. "Environmental education: a new religion?," *Journal of Environmental Education* 10(1):44-48, Fall 1978. P

______. "Response to air pollution, a study of attitudes and coping strategies of high school youths," *Environment and Behaviour:*127-151, September 1970. v.f.

______ and William B. Stapp, ed. *Environmental education: strategies toward a more livable future,* New York, John Wiley, 1974. 349 p. 614.7 SWA

Swanson, Carl P. "The role of the humanities in environmental education," *The American Biology Teacher* 37(2):84-89, 99, February 1975. v.f.

"The Tbilisi Declaration," *Connect* 3(1):1-8, January 1978. P

Thomas, M. Pugh; S. Frost and C. Fairhurst. "Environmental resources at Salford (a report)," *The International Journal of Environmental Studies* 9(1):21-30, March 1976. P

Tinker, Jon. "Don't waste away the earth," *New Internationalist* (40): 26-29, June 1976. P 275

Towler, John. "Are teachers trained in environmental education?," *Education Canada* 20(3):32-37, Autumn 1980. P

Trent, John H. "Changes and trends in environmental education (1970-1975)," *Journal of Environmental Education* 7(3):51-60, Spring 1976. P

Unesco, Paris. *L'éducation relative à l'environnement: les grandes orientations (de la conférence de Tbilisi)* Paris, 1980. 108 p. 614.7 UNE

______. *Environmental education of engineers: current trends and perspectives.* Paris, 1979. 51 p. Also in French: *Formation des ingénieurs et environnement; tendances et perspectives.* 614.7 UNE

[Unesco, Paris.] "A report on pilot projects in environmental education," *Connect* 3(2):1-8, May 1978. P

Unesco, Paris. *Trends in environmental education.* Paris, 1977. 244 p. Also in French: *Tendances de l'éducation relative à l'environnement.* 1977. 307 p. 614.707 UNE

Unesco. Regional Office for Education in Asia and Oceania. *Population and environmental education in the Asian region (an SDI Service for Population Education)* Bangkok, 1979. An excerpt from: Unesco Regional

Office for Education in Asia and Oceania. Population Education in Asia: a source book. Bangkok, 1975. p. 85-107.
614.7 UNE

[Unesco] Regional Workshop on Environmental Education in Asia and the Pacific, Bangkok, 22-29 September 1980. *Environmental education in Asia and the Pacific, report.* Bangkok, Unesco, 1980. 59 p.
614.7 UNE

[Unesco] *Country reports and working papers.* Bangkok, Unesco, 1980. 1 v. (various paging)
614.7 UNE

_____. Workshop on Environmental Education for Latin America, San Jose, Costa Rica, 29 October-7 November 1979. *Final report.* Paris, Unesco, 1979. 45 p. (ED-80/WS/87) mimeo.
614.707 UNE

[Unesco-UNEP] Intergovernmental Conference on Environmental Education, Tbilisi (USSR) 14-26 October 1977. *Final report.* Paris, Unesco, 1977. 101 p.
614.7 INT

_____. *Education and the challenge of environmental problems/L'éducation face aux problèmes de l'environnement.* 57 p. (Unesco/ENVED 4)
614.7 INT

_____. *International programme in environmental education.* Paris, Unesco, 1977. 20 p. (Unesco/ENVED 5) 20 p. Also in French: *Programme international d'éducation relative à l'environnement* (Unesco/PNUE 5)
614.7 INT

_____. *Needs and priorities in environmental education: an international survey* [Paris] Unesco, 1977. 20 p. + annexes. (Unesco/ENVED 6)
614.7 INT

_____. *Regional meetings of experts on environmental education; a synthetic report.* Paris, Unesco, 1977. 28 p. (Unesco/ENVED 7). Also in French: *Réunions régionales d'experts sur l'éducation relative à l'environnement: document de synthèse.*
614.7 INT

_____. *Major environmental problems in contemporary society.* Paris, Unesco, 1977. 16 p. (UNEP/ENVED 8). Also in French: *Les grands problèmes de l'environnement dans la société contemporaine.*
614.7 INT

_____. *The United Nations environmental programme and its contribution to the development of environmental education and training.* Paris, Unesco, 1977. 40 p. (UNEP/ENVED 9). Also in French: *Le programme des Nations Unies pour l'environnement et son apport au développement de l'éducation et de la formation environnementales.*
614.7 INT

_____. International Workshop on Environmental Education, Belgrade, 13-22 October 1975. *Final report* and *working papers.* Paris, Unesco, 1976. 60 p. and 1 v. (working papers)
614.7 UNE

_____. Meeting of Experts on Environmental Aspects of Engineering Education and Training, Paris, 17-21 June 1974. *Final report.* Paris, Unesco, 1976. 113 p. (United Nations Environmental Programme)
620.7 MEE

______. Regional Meeting of Experts on Environmental Education in Africa, Brazzaville, People's Republic of the Congo, 11-16 September 1976. *Final report [of the Meeting organized within the framework of the International Environmental Education Programme - Unesco and UNEP]* Paris, Unesco, 1977. 54 p. (ED-76/CONF. 665/COL.2)
614.707 UNE

[Unesco-UNEP] Regional Meeting of Experts on Environmental Education in Africa, Brazzaville, People's Republic of the Congo, 11-16 September 1976. *Environmental education needs and priorities; a preliminary survey of African region,* working document, Paris, 1976. 67 p. mimeo. (ED-76/CONF.665/COL.1)
614.707 UNE

______ Regional Meeting of Experts on Environmental Education in Asia, Bangkok, 15-20 November 1976. *Final report [of the Meeting* organized within the framework of the Unesco-UNEP Environmental Education Programme] Paris, Unesco, 1977. 70 p. (ED-77/WS/22)
614.707 UNE

______ Regional Meeting of Experts on Environmental Education in Europe, Helsinki, Finland, 27-31 January 1977. *Final report [of the Meeting* organized within the framework of the Unesco-UNEP International Environmental Programme] Paris, Unesco, 1977. 61 p. (ED 77/CONF. 601/COL.3) mimeo.
614.707 UNE

______ Regional Meeting of Experts on Environmental Education in Latin America and the Carribean, Bogotá, Colombia, 24-30 November 1976. *Final report [of the Meeting* organized within the framework of the Unesco-UNEP Environmental Education Programme.] Paris, Unesco, 1976. 54 p. mimeo.
614.707 UNE

______ Sub-regional Training Workshop on Environmental Education for the Carribean, Antigua, 9-20 June 1980. *Final report [of the Workshop* convened ... in the framework of the Unesco-UNEP International Environmental Programme] Paris, Unesco, 1980. 75 p. (ED-80/WS/115) mimeo.
614.707 UNE

United Nations Environment Programme (UNEP), Nairobi. *Environmental education and training: survey of activities in the area: report of the Executive Director.* Kenya, UNEP, 1978. 121 p. mimeo. (UNEP Report no. 2, 1978)
614.707 UNE

______. Executive Director. *Survey of activities in the area: environmental education and training, report.* Nairobi, 1978. 121 p. (UNEP report no. 2, 1978)
614.707 UNE

[U.S.] National Council for the Social Studies, Washington, D.C. *The environmental crisis; special issue of Social Education* 35(1), January 1971. Washington, D.C., 1971. 120 p. illus. (Contents: source and resources, p. 79-92, instructional media, p. 93-106)
301.31 U84e

______ National Science Teachers Association. *Environmental education in the elementary school,* compiled by Sylvia K. Shugrue and Berenice Lamberton. Washington, D.C. 1972. 45 p. Repr. from *Science and Children.*
614.707 NAT

Van den Broek, Jan M.M. and Eric H.M. Ealey. *Thailand reinforcement of the Faculty of Environment and Resource Studies, Mahidol University, Bangkok, report* prepared for the Government of Thailand. Paris, Unesco, 1979. 1 v. (various paging) Technical report RP/1977-78/2.151.3
614.707 VAN

Vidart, Daniel. "Environmental education - theory and practice," *Prospects, Quarterly Review of Education* 8(4):466-479, 1978. P

Voelker, Alan M. and Robert E. Horvat. "Elementary school children's views on solving selected environmental problems," *Science Education* 60(3):353-361, 1976. v.f.

Watts, D.G. *Environmental studies.* London, Routledge and Kegan Paul [c1969] 118 p. bibl. (*Students' library of education*) 301.3107

WCOTP/IUCN Pilot Seminar on Environmental Education Methodology in East Africa, Mombasa, 27 August-4 September 1974. *Final report.* Morges, World Confederation of Organizations of the Teaching Profession, 1977. 48 p., illus. 614.707 WCO

West Regional Workshop on Primary School Environmental Studies for In-service Educators, State Institute of Education, Pune, Maharashtra, 2-6 April 1979. *Report on phase one.* New Delhi, National Council of Educational Research and Training, 1979. 78 p. 614.707 WES

White, Roy C. "The state of the art of environmental education," *The Science Teacher:* 38-40, November 1970. P

Wilke, Richard J.; R. Ben Peyton and Harold R. Hungerford. *Strategies for the training of teachers in environmental education, a discussion guide for Unesco training workshops on environmental education,* prepared under Unesco contract. Paris, Unesco, 1980. 152 p. mimeo. 614.707 WIL

Williams, A.T. "The new environmentalism - a meaningless epithet, *Journal of Environmental Education* 10(4):4-6, Summer 1979. P

Wilson, J. *Environmental education: a report on recent developments in Victoria.* Adelaide, Australian Association for Environmental Education, 1980. 614.707 WIL

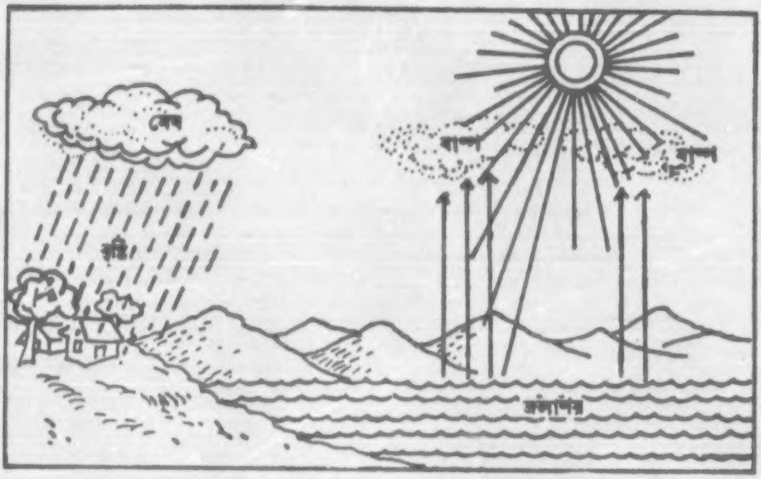
Womersley, J., and D. Stokes. *Environmental education: a conceptual framework.* Canberra, Curriculum Development Centre, 1980. (In press) 614.707 WOM

Workshop on Environmental Education, 7-8 March 1979. *[Report]* New Delhi, School of Environmental Science, 1979. 45 p. 614.707 SCH

Workshop on Evaluation in Environmental Studies at the Primary Stage, held at the National Institute of Education, New Delhi, 22-28 February 1979. *An approach to evaluation in environmental studies..., report of the Workshop.* New Delhi, Examination Reform Unit, National Council of Educational Research and Training, 1979. 61 p. mimeo. 614.707 WOR

"World Conference Adopts Declaration on Environmental Education," *Adult Education Information Notes* (1):1-2, 1978. P

Zipko, Stephen J. "Developing environmental ethics and national value judgements," *Science and children* 17(6):40-43, March 1980. P



ENVIRONMENTAL EDUCATION - TEACHING/LEARNING MATERIALS

Agricultural Science Materials Project (ASMP) */ASMP Units/* Student and teacher ed. Canberra, The Curriculum Development Centre, 1979. 25 v. (25 units)

630.7 AGR

/APEID/ Technical Working Group Meeting on Science in Basic Functional Education: Links with Real-Life Situations, Manila, Philippines. *Goodbye waste.* Bangkok, ACEID, Unesco, 1979. 29 p. (*Self-learning instructional modules in science* 2)

c.f.

Asian Regional Conference in Biological Education, 5th Singapore, 10-15 June 1974. *Proceedings.*

- *A proposed syllabus for teaching environmental pollution at Secondary III and IV in Singapore schools,* by Lee Chang Hong, p. 51-56.
- *Teaching of ecology in Singapore schools: a sample study,* by Johanna Tan, p. 57-60.
- *A study in the teaching of environmental education,* by Yojiro Nakajima, p. 104-109.

574.07 ASI

Asian Workshop on Environmental Education, Bhopal, Regional College of Education, 10-16 August 1978. *Pilot project in environmental education in Madhya Pradesh; report.* Bhopal, Regional College of Education, 1978. 46 p.

_____. *Instructional material for classes III-V.* 2 v. 614.7 ASI

Australia. Curriculum Development Centre, Canberra. *Habitat - human settlements for the future.* Canberra, 1976. 5 v., 1 set of 80 slides. Contents: -*Living,* 15 p. -*Population,* 16 p. -*Planning resources,* 16 p. -*Teacher's handbook,* 24 p. Poster on the Belgrade Charter.

K301.31 CUR

Bibliographical supplement

Australia. Curriculum Development Centre [Manuka] *ASEP (Australian Science Education Project) Units.* 48 units

Contents of Units: Student book, Record book, Teachers handbook, Charts, Films, Slides, Equipment packs...

Baldicer, a simulation game on feeding the world's people (Kit) prepared by Georgeann Wilcoxson. Atlanta, Knox Press, 1970.

Contents: Participants' instructions, Game director's manual, Tally sheet, Work yield inventory, 2 posters. K 630

Bangladesh. [Ministry of Education] Textbook Board. *Environmental learning (science) class III, class IV,* [Dacca] 1979. 2 v. 607.4 BAN

_____. _____. *Environmental learning (social studies) class III, class IV,* [Dacca] 1978. 2 v. 607.4 BAN

Battad, Romualdo. "Conservation education, teaching unit in social studies for grades V and VI," *The Modern Teacher* XXVI(8):412-414, 418, January 1979. P

Bengtsson, Goran. *An introduction to ecology.* Morges, Switzerland, International Youth Federation for Environmental Studies and Conservation under sponsorship of the International Union for Conservation of Nature and Natural Resources [1978?] 39 p. 614.7 BEN

Bhopal (India) Regional College of Education. Project Environmental Group. "Teaching through environment," *The Primary Teacher* V(2): 11-14, April 1980. P

_____. _____, ed. by A.B. Saxena, B.S. Gupta and J.S. Rajput. Bhopal, 1978. 115 p. 614.7 BHO

Biological Sciences Curriculum Studies, Boulder, Colorado. *Biology: an environmental approach.* London, John Murray, 1971. 5 v. Contents: -1. *The world of life.* -2. *Diversity among living things.* 3. *Patterns in the living world.* -4. *Looking into organisms.* -5. *Man and his environment.* 574.07 BIO

"Biosphere reserves in Australia - improving man's partnership with the environment," *Unesco News (Australia)* 29(1):8-11, 1978. P

Bowman, Mary Lynne and John F. Disinger. *Land use management activities for the classroom.* Columbus, ERIC Center for Science, Mathematics and Environmental Education, Ohio State University, 1977. 260 p.

NA P375.02 B7871

_____ and Herbert L. Coon. *Recycling: activities for the classroom.* Columbus ERIC Clearing-house for Science, Mathematics, and Environmental Education, Ohio State University, 1978. 147 p. NA P375.02 B787r

Bowman, Mary Lynne. *Values activities in environmental education,* with a foreward by David L. Hanselman. Columbus, ERIC Clearinghouse for Science, Mathematics and Environmental Education, Ohio State University, 1979. 142 p. NA P375.02 B78Mv

Brennan, Matthew J. ed. *People and their environment: teachers' curriculum guide to conservation education.* Chicago, Ill., Ferguson Publishing [c1969] 8 v.
614.7 BRE

Busch, Phyllis S. *The urban environment: a teacher's guide.* Chicago, Ill., J.G. Ferguson Publishing [1975] 217 p.
614.7 BUS

The child; an environment crossword puzzles [for primary school students] New York, U.S. Committee for UNICEF [1977].
G14

Conservation and Environmental Studies Centre (CESC), Browns Mills, N.J. *Teacher's workshop handbook for resident environmental education programmes.* Browns Mills, N.J., c1970. 1 v. (unpaged)
301.3107 C421t

Coon, Herbert L. and Mary Lynne Bowman. *Energy activities for the classroom: volume II.* Columbus, ERIC Clearinghouse for Science, Mathematics and Environmental Education, Ohio State University, 1978. 164 p.
NA P375.02 C775en

______. *Environmental education in the urban setting: rationale and teaching activities,* Columbus, ERIC Center for Science, Mathematics, and Environmental Education, Ohio State University, 1976 198 p.
NA P375.02 C775en

Environmental Centre of the Philippines, Manila. *The living environment; the quality of life.* Manila, National Media Production Centre, 1975. 16 p. *(Environmental series,* vol. 1, no. 1)
614.707 ENV

______. *The school environment (environmental awareness).* Manila, National Media Product Center, 1975. 8 p. *(Environmental series,* vol. 1, no. 3)
614.707 ENV

Experimental Course on the Teaching of World Problems to Secondary School Teachers, Suva, March-June 1976. *Report,* prepared by Stephanie Flynn. Suva, School of Education, University of the South Pacific, 1976. 211 p. mimeo.
307 EXP

Falanruw, Margie Cushing. *Environmental education handbook.* Noumea, New Caledonia, South Pacific Commission, 1979. 38 p.
614.707 FAL

______. *Environmental mini-lessons,* drawing by Stanley Kenrad, Lita Payne and Laurence Pong. Noumea, New Caledonia, South Pacific Commission, 1979. 1 v. (various paging) mimeo.
614.707 FAL

For a better world/Pour un monde meilleur (Slides) Paris, Unesco [n.d.] 48 slides col.
SL 614.7

Garcia, Marcela B. "Activities on common pollution problems," *The Modern Teacher* XXVI(3):121-122, August 1978; (4):186-188, September 1978.
P

______. "Energy conservation is working for a common good," *The Modern Teacher* XXVI(9):458-459, February 1979; XXVII(1):19-21, June 1979.
P

______. "An interdisciplinary approach to environmental education," *The Modern Teacher (In the Grade School)* XXIV(3):147-148, August 1975;

(4):216-221, September 1975; (5):258-262, October 1975; (6):323-328, November 1975. P

Garcia, Marcela B. "Introducing human ecology in the lower grades," *The Modern Teacher* XXVI(8):402-404, January 1979. P

______. "Managing our water resources wisely," *The Modern Teacher* XXVII(7):370-371, December 1979. P

______. "Population growth and environment," *The Modern Teacher* XXIV(8):418-420, January 1977. P

Goyal, B.R., M.T. Ramji and P. Dasgupta. *Cleanliness programmes in schools, a handbook for teachers.* New Delhi, National Council of Educational Research and Training, 1976. 28 p. c.f.

Haakonsen, Harry O., and others. "A self-instructional approach to environmental decision making: focus on land use," *Journal of Environmental Education* 8(3):17-25, Spring 1977. P

Halili, Zenaida Madriaga. "On the New Society, On the Green Revolution, On Sanitation, On Peace and Order," *The Modern Teacher (In the Grade School)* XXIV(1):50, June 1975. P

Hammersley, A., E. Jones [and] G.A. Perry. *Approaches to environmental studies: teachers' guide book 1.* London, Blandford Press [c1968] 128 p. illus, charts. 614.7 HAM

Hernbroad, William R. *Multidisciplinary wildlife teaching activities.* Columbus, ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Ohio State University, 1978. 86 p. NA P375.02 H557m

How man pollutes his world [Poster] Washington, D.C., National Geographic Magazine, 1970. 1 poster col 29.5" x 42.5" 614.7 HOW

India. National Council of Educational Research and Training. *Learning science*, pt. 1. New Delhi, 1977. 233 p.

Contents: *Materials around us*, p. 14-28. - *Changes around us*, p. 40-50. - *The universe.* - *The living world.* - *Structure and function in plants and animals.* - *Man's dependence on plants and animals and the balance of nature.* - *Adaptability to the environment*, etc. p. 85-202. 507 IND

______. ______. *Learning science, an integrated science textbook for class VII, Part II*, by B. Gangui [and others] New Delhi, 1978. 507 IND

______. ______. *Learning science through the environment; a textbook for primary schools, class III.* New Delhi, Macmillan Co. of India, 1977. 65 p. illus. 507 IND

______. ______. *Life sciences: a textbook for secondary schools, classes IX-X.* New Delhi, 1975. 298 p.

Contents: *Organization of life.* - *Conservation of nature and natural resources.* - *Life processes.* - *Origin and continuity of life.* - *Agricultural practices....* - *Nutrition and population education.* 301.3107 Ic151

______. ______. *Man and environment: a textbook of geography for class X*, by N. Anantapadmanabhan. New Delhi, 1976. 97 p. 301.3107 c15m

India. National Council of Educational Research and Training. Department of Education in Science and Mathematics. *Environmental studies - II (General science for primary schools; syllabus for classes III, IV and V.* New Delhi, 1977? 29 p., mimeo.
614.7 IND

______. ______. *Environmental studies: a teacher's guide; classes I-II.* New Delhi, 1977. 61 p. illus.
614.7 IND

______. ______. Primary Curriculum Development Cell. "Environmental studies," in *Minimum learning continuum.* New Delhi, 1979. (NCERT publication no. 3) p. 26-32.
372.954 IND

[India] Southern Regional Workshop [on Environmental Studies] Sarva Jana Higher Secondary School, Coimbatore, 8-12 January 1979 and 19-23 February 1979. [*Worksheets*] New Delhi, Department of Education in Science and Mathematics, NCERT, 1979. 2 v.
614.707 IND

Indiana University. School of Continuing Studies. Independent Study Division. *Multidisciplinary education 31E: Environmental studies; course,* designed by Donald R. Winslow. Bloomington, Indiana, 1980. viii, 43 + p.
614.707 IND

Interaction Science Curriculum Project. *Interaction of man and the biosphere; inquiry in life science.* Chicago, Rand McNally, 1970. 4 v.

Contents: -1. *Teacher's guide.* -2. *Student text.* -3. *Final test, 1 and 2.* -4. *Achievement test, 1-4.*
574.07 ISCP

Intermediate Science Curriculum Study. *Probing the nature world.* Morristown, N.J., Silver Burdett, 1970. 3 v.

Contents: v.1. *Student record book.* v.3A. *Environmental science, crusty problems and Why you're you.* v.3B. *In orbit, Well-being, and What's up.*
507 INT

International Geographical Union, Freiburg, Baden. Commission on Geography. *Teaching materials on population, international understanding and environmental education, prepared on the basis of plans formulated at the Unesco/IGU Regional Workshop on the Teaching of Geography, Sydney, Australia, September 1973.* Paris, Unesco, 1975. 158 p.
614.707 INT

Koh Tsu Koon and Loke Liok Ec. "Environmental issues ...," in *Consumer education, a comprehensive reader for Malaysian secondary schools.* Penang, Consumers' Association of Penang, 1977. p. 27-97.
614.7 CON

Learning in science II: Ecology laboratory (Kit) Chicago, Science Research Associates, 1966.

Contents: 3 sets of activity cards (pink, violet, green for *"Big Ideas"* 1-6; *"Big Ideas"* booklets 1-6; Laboratory picture chart; Contents guide chart; Key card; Teacher's instructional booklet.
K510.7 LEA

Malaysia. Ministry of Education. Curriculum Development Centre. *Man and his effects on the environment: Crowded classrooms, Deforestation, Employment, Erosion, Extensive cultivation, Housing, Medical facilities, People, Transport, Water and air pollution.* Kuala Lumpur [1979] set of 11 posters, 33 x 48 cm. col.
614.7 MAL

Man and the humid tropics (Kit) Paris, Unesco, 1980. 74 slides, col.; 23 minute cassette; 1 booklet containing script and guide *(Man and the Biosphere (MAB) Audio-visual series 1)*
K581.5 UNE

Mueller, Elisabeth. *L'équilibre dans la nature [The balance of nature]*, illus. by Christian Bretecher. Tunis, Population Council, 1971. 18 p.
301.3107 M946e

Nadel, Ira Bruce and others. *Trees in the city.* New York, Pergamon Press, 1977. 94 p. (*Habitat texts,* no. 1)
301.3107 N134t

Nair, N. Balakrishnan. *The discovery of the oceans.* New Delhi, National Council of Educational Research and Training, 1969. 183 p.
551.46 NAI

New York. State University, Albany and New York. State Education Department. *Environment and development in a developing nation: India, social studies for grade 9.* Albany, 1978. 39 p. (*Environmental education infusion units*)
614.707 NI

______. ______. ______. *An environmental syllabus: grades 10, 11, 12.* New York, 1980. 230 p.
614.707 NEW

OBIS Samples: module overview, developed by Outdoor Biology Instructional Strategies, University of California. Nashua, New Hampshire, Delta Education, 1979.

Contents: 4 folders of *OBIS activities* and *Leaders survival kit.*

K574 OBI

OBIS Schoolyard: module overview, developed by Outdoor Biology Instructional Strategies, University of California. Nashua, New Hampshire, Delta Education, 1979.

Contents: 7 folders of *OBIS activities* and *Leaders survival kit.*

K574 OBI

Papua New Guinea. Ministry of Education, Science and Culture. Provincial Education Services. *Grade 12 science major course, biology, syllabus: The living organism and its environment...* Konedolen, 1980. 32 p.
574.07 PAP

Perry, G.A., E. Jones and A. Hammersley. *The teachers' handbook for environmental studies.* London, Blandford Press, 1974. 301 p.
301.3107 P462t

Philippines. University. Science Education Centre, Quezon City. *Elementary school science.* Quezon City, 1973-1976. 5 v.
507 PHI

______. ______. *Environmental science.* Rev. experimental ed. Quezon City, 1972. 3 v.
507 PHI

______. ______. *Making a sealed toilet.* Diliman, Quezon City, 1978. 51 p.
614.7 PHI

______. ______. *Philippine birds and mammals, a project of the U.P. Science Education Centre,* by Dioscorro S. Rabov. Diliman, Quezon City, 1977. 284 p.
574.07 PHI

Philippines. University. Science Education Centre. *Things around us: textbook and teacher's manual.* Manila [Ministry] of Education and Culture, 1977. 2 v. (*Elementary school science* 1)
507 PHI

______. ______. *Waste not! Want not! module, Teacher's guide, Student's key...* Diliman, Quezon City [1979?] 3 v. mimeo.
KIT

SEAMEO Regional Centre for Education in Science and Mathematics, Penang. *Another form of pollution - too much sound: a training assignment for the RECSAM course: modern methods of teaching and evaluating,* by Mohd. Shapee bin Mohd. Zain and Louise Tuwaidan. Penang, SEAMEO-RECSAM, 1974. 50 p. mimeo.
614.7 SEA

______. *Environmental science for grade 2 - water, a training assignment, for the RECSAM Course: Modern methods of teaching and evaluating elementary science,* by Pancracio M. Adiarte, Lourdes T. Astilla and Caroline Q. San Luis. New Delhi, 1974. 33 p. mimeo.
614.7 SEA

______. *The pond ecosystem: a teaching unit for secondary schools.* Penang, 1974. 9 p.
v.f.

______. *Prototype teaching units in ecology for secondary schools in Southeast Asia.* Penang, 1972. 1 v. (various paging)
574.5 SEA

______. *Spoiling water; a prototype teaching module at primary school level.* Trial ed. Penang, SEAMEO-RECSAM, 1975. 48 p.
614.7 SEA

______. *A teaching unit on soil erosion and conservation for grade 4,* by Sumadi and others. Penang, 1974. 12 p.
301.3107 SEA

Sierra Leone. University. Institute of Education. Social Studies Curriculum Unit. *Course of study: man in his environment; Book 1: Man himself - population education supplement for pupils.* Freetown, Ministry of Education, 1979. 22 p. (*National Programme in Social Studies*)
AFR P371.32 U58c

Bibliographical supplement

Sierra Leone University. Institute of Education. Social Studies Curriculum Unit. *Course of study: man in his environment; Book 2. Social studies integrated with population education; guideline for teachers and pupils' book.* Experimental ed. Freetown, 1980. 2 v. (*National Programme in Social Studies*)
AFR P375.02 U53c
AFR P371.32 U58co

Solomon Islands. Ministry of Education and Cultural Affairs. *Solomon Islands environmental approach to science [for Standards I-VI]* Solomon Islands, 1976. 3 v.
614.707 SOL

South Pacific Commission, Noumea, New Caledonia. *SPC environmental education programme teaching chart: how nature works.* Noumea, Bridge Printery Pty. Ltd. 1 sheet 62 x 89 cm. and 3 circular overlays
614.707 SOU

Stapp, W.B. and D.A. Cox. *Environmental education activities manual.* Ann Arbor, University of Michigan Press, 1979. 764 p.
614.707 STA

Stien Nuvongsri, Daweedej Pongsuwan and Pranee Suthiarom. *A teaching unit on water pollution for grade 2.* Penang, SEAMEO Regional Centre for Education in Science and Mathematics, 1974. 13 p. (TCE-1: *Modern methods of teaching and evaluating elementary science*)
507.2 SEA

Teaching about the child and world environment. New York, United States Committee for UNICEF [1977] 1 packet of materials. (*Elementary teacher's kit* no. 5420)

Contents: Three-teaching units on world environment with an emphasis on responses to natural disasters. Includes teacher's guide, annotated bibliography, pictorial and print resources for elementary grades.
KIT

Teron, Salas J. "The wonder of plants," [a poem] *The Modern Teacher* (In the Grade School) XXIII(1):54, June 1974.
P

Thailand. Ministry of Education. Department of Educational Techniques. *Handbook on the teaching of conservation of natural resources and environment.* Bangkok, 1980. 50 p. In Thai
614.7 THA

______. ______. ______. *Knowing about natural resources.* Bangkok, 1979. 211 p. (*Reference book on environmental studies*) In Thai
614.7 THA

______. ______. ______. *[Source book on natural resources and environment conservation,* Bangkok, 1980] 195 p. In Thai
THA P370.2 T364so

______. ______. ______. *What we should know about environmental law.* Bangkok, 1980. 81 p. (*Reference book for secondary schools*) In Thai
614.7 THA

______. ______. ______. Curriculum Development Centre. *If you love me [story of a waste bin]* Bangkok, 1977. 16 p. (*Supplementary reader for primary schools*) In Thai
614.7 THA

______. ______. ______. ______. *Learn, our home town; pt. 1. Digging a well.* Bangkok, 1977. 16 p. (*Supplementary reader for primary schools*)
614.7 THA

Unesco, Paris. *New Unesco source book for science teaching.* Paris, 1973. 270 p.
507 UNE

Unesco. Regional Office for Education in Asia and the Pacific. Population Education Clearing House, comp. *Population education in: Geography, Health, Mathematics, Science, Social Science.* Bangkok, 1980. 5 v. (*Population education programme service*)
P375.02 UNE

______. Regional Office for Education in Asia and Oceania. Population Education Clearing House. *Selected teaching lessons on environmental and population for grades 5 to 9 (An SDI Service for Population Education).* Bangkok, 1976. 37 p. mimeo.
614.7 UNE

Universiti Sains Malaysia. *Panduan penyelidikan pusat pengajian saina Kajihayat, 1977/Research Handbook: School of Biological Science, 1977.* 19 p. mimeo.
574 UNI

Urban Life - Population Education Institute. *Production, pollution, population; issues for a changing world,* by Lester C. McCrea and others. Teachers' ed. Baltimore, City Public Schools, 1977. 56 p.
NA P375.02 U12p

/U.S/ National Audubon Society. *A place to live; text and teacher's manual,* illus. by Harriett Sosson. New York, 1970. 2 v.
GEN P371-321 N277 p

______ National Science Teachers Association, Washington, D.C. *Elementary science packet, no. 3: Environmental education II.* Washington, D.C., 1973. 1 packet.
507 NAT

______. *Energy environment source book.* Washington, D.C., 1975. 2 pts. in 1.
Contents: *Energy-environment materials guide.* 1975.
Energy environment mini-unit guide. 1975.
614.707 NAT

Venkatesh, Chakravarti S. *Our tree neighbours.* New Delhi, National Council of Educational Research and Training, 1976. 362 p.
582.160 954

Victoria, Pablo J. "The Philippines is beautiful, but we must stop desecrating its beauty," *The Modern Teacher (in the Grade School)* XXIII(3):173-175, August 1974.
P

Wagner, Richard H. *Environment and man.* 3d. ed. New York, Norton, 1978. XIII, 591 p. illus.
614.7 WAG

Warren, Keith and Julia Warren. *Preparation for understanding, helping children to discover order in the world around them.* New Delhi, UNICEF, 1975. 25 p.
507 UNI

Washington (State). Department of Ecology. *A student's guide to environmental discovery.* /Olympia, 1974/ 37 p.
R 060 W319A

EDUCATIONAL ENVIRONMENT

David, Thomas G., and Benjamin D. Wright. *Learning environment.* Chicago, University of Chicago Press /1975/ 233 p.
371.102 DAV

Durlak, Jerome and Joan Lehman. *The school environment: a study of users patterns.* (Microfiche) Toronto, Ontario Ministry of Education, 1973

Eggleston, John. *The ecology of the school.* London, Methuen, 1977. 127 p.
371.102 EGG

Hawkins, Donald E. and Dennis A. Vinton. *The environmental classroom.* Englewood Cliffs, N.J., Prentice-Hall /1973/ 374 p.
574.5 HAW

Keeves, John P. *Educational environment and student achievement.* Stockholm, Almqvist and Wiksell /c1972/ 311 p. (Stockholm studies in educational psychology, 20)
153.9 KEE

______. *The effects of the conditions of learning in the schools on educational achievement.* Hawthorn, Victoria, Australian Council for Educational Research, 1974. 21 p. (IEA Australia report 1974.2)
153.9 KEE

King, Jonathan., Robert W. Marans and others. *The effectiveness of educational environments: a survey of recent research,* prepared for Division of Educational Policy and Planning, Unesco (Paris). Ann Arbor, Architectural Research Laboratory, College of Architecture and Urban Planning, University of Michigan, 1978. 75 p. mimeo.
371.102 KIN

______. *The physical environment and the learning process: a survey of recent research; a report prepared for Unesco.* Ann Arbor, Institute for Social Research; Architectural Research Laboratory, College of Architecture and Urban Planning, University of Michigan, 1979. 85 p. (Institute for Social Research. *Research report series*)
370.158 KIN

Margoribanks, Kevin, ed. *Environments for learning.* Windsor, Berks, NFER Pub. Co., 1974. 286 p.
153.1 MAR

Moos, Rudolf H. *Conceptualizing educational environments.* New York, Asia Society-SEADAG [1973] 31 p. mimeo. (*SEADAG papers on problems of development in Southeast Asia*)
614.79 MOO

Richardson, Elizabeth. *The environment of learning: conflict and understanding in the secondary school.* London, Heinemann Educational Books [1973] 247 p.
371.5 RIC

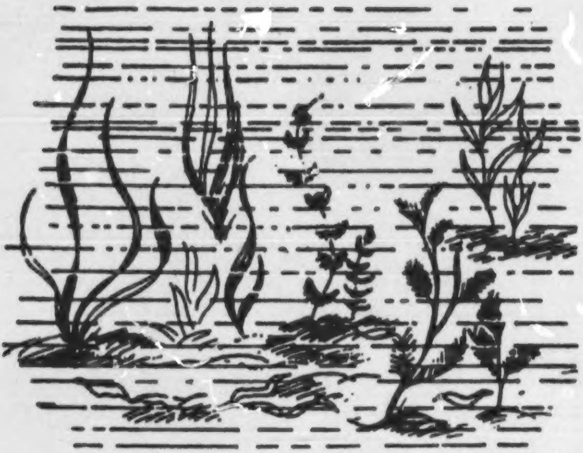
Taylor, Anne P., and George Vlastos. *School zone: learning environments for children.* New York, Van Nostrand Reinhold [1975] 144 p.
727.1 TAY

Unesco. Unit for Co-operation with UNICEF and WFP. *Environment and child development... expounding a theory of the ecology of human development.* Paris, 1980. 11 p. mimeo. (Child, family, community: notes, comments... N.S. 52)

U.S. Department of Housing and Urban Development. Office of International Affairs. *Children in the built environment; a bibliography.* [Washington, D.C.] 1979. 21 p.
R301.31 USA

Walberg, Herbert J., ed. *Educational environments and effects: evaluation, policy and productivity.* Berkeley, McCutchan, 1979. vii, 419 p.
371.102 WAL

Winant, Rooskandar. *Environmental control in school buildings through planting.* Bangkok, Unesco Regional Office for Education in Asia, 1964. 15 p. illus. Asian Institute for School Building Research. (*Occasional papers - School Building*, no. 9)
727.WIN



ENVIRONMENT

Agriculture and the environment. New York, CIBA-Geigy Corp. /n.d./ 16 p.
v.f.

"Air quality management in Thailand," *The NEB Newsletter*:5, June 1979.
P

Alexandre, Ariel and Christian Averous. "Innovative management of urban transport for a better environment," *OECD Observer* (96):33-37, January 1979.
P

Allen, Robert. *How to save the world, strategy for world conservation.* London, Kogan Page /for/ IUCN-UNEP-WWF, 1980. 150 p.
333.9 ALL

Ambalavanar, V. *Environmental considerations in the economic development of Sri Lanka, paper presented at the Consultative Meeting on Methodology and Techniques for Identification and Incorporation of Environmental Dimensions in Development Planning, Bangkok, 14-16 February 1979.* /Colombo/ 1979. 6 p. mimeo.

Analyse socio-économique de l'environnement: problèmes de méthode; documents présentés au symposium tenu à Saint-Disier(Grenoble) du 12 au 15 décembre 1972. Paris, Mouton, /1973/ 248 p. (*Environnement et sciences sociales,* 3)
614.7 ANA

Andersson, Birgitta. "Ideal home or emergency shelter," *Synopses from Swedish Building Research* 7:6, October 1977.

Antiola, Soledad L. "Directions in public understanding of environmental issues," *Social Club Reporter* 7(2):6-8, January-May 1977.
P

Arthur, Don R. *Survival: man and his environment* /London/ English Universities Press /c1969/ 218 p. illus.
301.31 A788s

Asia/Pacific Tripartite Regional Seminar on Education and Training Policies and Programmes in the Field of Working Conditions and

Environment. Bangkok, 24-28 November 1980. */Working papers/* 1980. 1 v. (various papers)
Bangkok, ILO

Australian National Commission for Unesco Seminar, Kambalda, (Western Australia) 18-23 August 1973. *Man and the environment: new towns in isolated settings;* /report/ Canberra, Australian Government Publishing Service, 1976. 304 p.
309.26 AUS

Bairoch, Paul. *Révolution industrielle et sous-développement.* Paris, Mouton Editeur, 1974. 381 p.
338.09 BAI

/Bangladesh/ National Media Seminar on Environmental Awareness, Press Institute of Bangladesh, 5-11 January 1979. *Report and recommendations.* /Dacca, 1979/ 23 p. mimeo.
c.f

Barbin, Christina. "Rome: A field study in urban ecology," *Unesco Features* (28):1-4, 1980.
v.f

Barr, John. *The environmental handbook: action guide for the UN.* London, Ballantine/Friends of the Earth Book, in association with Pan Books Ltd., /c1971/ 333 p.
614.7 BAR

Barrett, Gary W. and Claire A. Puchy. "Environmental science: a new direction in environmental studies," *The International Journal of Environmental Studies* 10(3):157-160, 1977.
P

Batisse, Michel. "Can we keep our planet habitable," *The Unesco Courier* (22d yr.):4-6, January 1969.
P

______. "Man and the biosphere," *World Health*:4-9, June 1978.
P

"Behind the environment alarm," *CERES FAO Review* 3(3):1-65, May-June 1970.
P

Behrman, Daniel. *In partnership with nature: Unesco and the environment.* 2d. rev. ed. Paris, Unesco, 1973. 111 p. (*Unesco and its programme,* no. 11)
614.7 BEH

Beranek, Leo L. "Street and air traffic noise and what we can do about it," *The Unesco Courier* (20th yr.) 12-18, July 1967.
P

Berry, Brian J.L. and Frank E. Horton. *Urban environmental management; planning for pollution control.* Englewood Cliffs, N.J., Prentice-Hall /1974/ 425 p.
614.7 BER

Binamira, Ramon P. *Green revolution and ecological change in the rural areas, paper presented at ASEAN Seminar on "Social Problems Resulting from Rapid Social Change," Jakarta, 17-21 January 1977.* /Jakarta, ASEAN, 1978/ 15 p. mimeo.
630.7 BIN

Biological Sciences Curriculum Study. *Investigating your environment.* Menlo Park, Addison-Wesley, 1975. 10 v.

Contents: *Teachers' handbook, Student handbook,* Environmental resource papers: Bk. 1. *The environment: some viewpoints.* -BK. 2. *The price of progress.* -Bk. 3. *Food for humanity.* -Bk. 4. *Human population.* -Bk. 5. *Solid waste.* -Bk. 6. *Pesticides.* - Bk. 7. *Land use.* -Bk. 8. *Water quality.*
614.7 BSC

Bibliographical supplement

A blueprint for survival, by the editors of the *Ecologist*. Hammondsworth, Penguin Books, 1972. 139 p. First published as vol. 2, no. 1 of the *Ecologist*, 1972.
301.31 B658

Brancher, David, ed. *The environment in engineering education*. Paris, Unesco, 1980. 111 p. (*Studies in engineering education 9)*
607 BRA

Brick, Barbary, comp. *Squatter settlements in developing countries: a bibliography*. Canberra, Australian National University Press, 1975. 158 p. (Research School of Pacific Studies. *Aids to research ser. no. A/3*)
301.31 BRI

Brown, Lester R. *The twenty-ninth day; accommodating human needs and numbers to the earth's resources*. New York, W.W. Norton, 1978. 363 p. (*World Watch Institute book*)
301.31 B878t

______, /and/ Gail W. Finsterbusch. *Man and his environment: food*. New York, Harper and Row, 1972. x, 208 p.
614.7 BRO

Bryce-Smith, Derek. "Chemical pollution in cities and its social consequences," *The International Journal of Environmental Studies* 9(1):31-36, March 1979.
P

Cain, Stanley A. "Man and his environment," in Michael Micklin. *Population, environment and social organization: current issues in human ecology*. Hinsdale, Ill., Dryden Press, 1973. p. 100-106.
301.31 M625p

Cant, Garth and others, ed. *Science in a rural community, report... 1977 MAB Seminar*. Canterbury, National Commission for Unesco... 1979. 26 p.
581.5 CAN

Canter, David, and Terence Lee, ed. *Psychology and the built environment*. London, Architectural Press /1974/ 213 p.
711.1 CAN

Chaisinn Maninan /and others/ *A study of illegal deforestation in the reserved forest area at the Sakaerat Environmental Research Station*. Bangkok, Environmental and Ecological Research Department, Applied Scientific Research Corporation of Thailand, 1976. 53 p.
634.9 CHA

Chanda, Rajinder N. "Struggling for shelter in developing countries: the Delhi experience," *Design Incorporating Indian Builder* 22(1):21-26, January 1978.
P

Chen, Kan; Karl F. Lagler and others. *Growth policy: population, environment, and beyond*. Ann Arbor, University of Michigan Press, c1974. 237 p.
301.32 C518g

Cherfas, Jeremy. "Making the environmental network," *New Scientist* 84(1179):362-365, 1 November 1979.
P

Chulalongkorn University. Institute of Environmental Research, Bangkok. *Progress report; studies on water and land use management in the Lower Chao Phraya Basin and related problems*. Bangkok, 1978. 24 p.
614.7 CHU

Chulalongkorn University. Institute of Environmental Research, Bangkok. *Water pollution in Thailand; abstracts [of lectures].* Bangkok, 1979. 1 v. 614.7 INS

Coale, Ansley J., ed. *Economic factors in population growth; proceedings of a Conference held by the International Economic Association at Valescure, France.* London, Macmillan, 1976. 600 p. 330.9 C652e

Cohen, Saul B., ed. *Geography and the American environment.* Washington, D.C., Voice of America Forum Lectures, 1968. vii, 304 p. (*Voice of America forum lectures*) 614.7 COH

Cole, L.K., R.L. Metcalf and J.R. Sanborn. "Environmental fate of insecticides in terrestrial model ecosystems," *The International Journal of Environmental Studies* 10(1):7-14, November 1976. P

Colloquium on the Working Environment in the Construction Industry, 27-29 March 1979, Stockholm. *Proceedings.* Stockholm, Swedish Council for Building Research, 1980. 205 p. 614.7 COL

A communication strategy for a rural water supply project in Thailand; guidelines for participatory workshops for local government officials. Bangkok, Thailand Department of Health in co-operation with UNICEF, 1979. 41 p. c.f.

Conacher, A.J. "Resources and environmental management: some fundamental concepts and definitions," *Search* 9(12):437-441, December 1978. P

Conference on the Environment of Human Settlements: Human Well-Being in Cities, Brussels, April 1976. *Proceedings of the Conference commissioned for the World Environment and Resources Council (WERC),* ed. by P. Laconte and others. Oxford, Pergamon Press, 1976. 2 v. 301.3 E61c

Consumers' Association of Penang. *Crisis in Malaysian fishing,* Penang, 1977. 22 p. c.f.

______. *A forest is dying: do something.* Penang [1978?] 1 foldout. c.f.

______. *The Malaysian environment: Heading for disaster.* Penang [1977?] 1 foldout. c.f.

______. *Noise pollution; an awareness problems in Penang.* Penang, 1976?. 42 p. c.f.

______. *Padi pollution in Kuala Kedah.* Penang, 1978. 44 p. c.f.

______. *Pollution: Kuala Juru's battle for survival.*. Pulau Pinang, 1976. 73 p. c.f.

Creating the human environment; a report of the American Institute of Architects, by Gerald M. McCue, Williams R. Ewald, Jr., and the Midwest Research Institute. Urbana, University of Illinois Press [c1970] 339 p. 301.31 C912

Dag Hammarskjold Foundation. *Another development: approaches and strategies [by] Fernando Henrique Curdoso [and others]* Uppsala, 1977. 265 p. 330.9 NER

Bibliographical supplement

Dag Hammarskjold Foundation. *Outer limits and human needs: resource and environmental issues of development strategies*, ed. by William H. Matthews. Uppsala, 1976. 102 p. 301.31 D125o

"The danger of sounds we cannot hear," *The Unesco Courier* (20th yr.): 28-31, July 1967. P

Dasmann, R.F. *Planet in peril? Man and the biosphere today.* Paris, Unesco/Harmondsworth, Penguin Books, 1972. 135 p. 614.7 DAS

Deutsch, Karl, W., ed. *Eco-social systems and eco-politics: a reader on human and social implications of environmental management in developing countries.* Paris, Unesco, 1977. 236 p. 574.5 DEU

Di Castri, Francesco and Gisbert Glaser. "Highlands and islands, ecosystems in danger," *The Unesco Courier* (33rd Year):6-11 April 1980. P, v.f.

Di Castri, Francesco and Malcolm Hadley. "Ecological approaches to land resources management in the tropics: some case studies from the Man and the Biosphere (MAB) programme," in *Glimpses of ecology, Professor R. Misra commemoration volume.* Jaipur, International Scientific Publications, 1978. p. 569-586. Reprint. v.f.

_____. *Ecological training for developing countries: strategies and actions of the MAB programmes.* New York, Plenum Publishing Corp., 1980. 17 p. Reprint. v.f.

_____. "A typology of scientific bottlenecks to natural resources development," *Geo Journal, International Journal for Physical, Biological and Human Geosciences and Their Application in Environmental Planning and Ecology* 3(6):513-522, 1979. Reprint. v.f.

_____, and Jeanne Damlamian. "The ecology of an international scientific project: insights from the Man and the Biosphere Programme," *Impact of Science on Society* 30(4):247-260, 1980. P, v.f.

Diamant, R.M.E. *The prevention of pollution.* London, Pitman Publishing /1974/ 268 p. 614.7 DIA

Dickson, W.L. "Squatter settlements in developing countries," *Chartered Surveyor* 109(12):393-395, July 1977. P

Draggan, S. "The microcosm as a tool for estimation of environmental transport of toxic materials," *The International Journal of Environmental Studies* 10(1):65-70, November 1976. P

D'Souza, Joseph Bain, "Out in the cold," *The Unesco Courier*, (29th yr.): 20, June 1976 P

Dunlop, Riley E. and Robert Bruce Heffernan. "Outdoor recreation and environmental concern: an empirical examination," *Rural Sociology* 40(1):18-29, Spring 1975. P

Dwyer, D.J. *People and housing in third world cities: perspectives on the problem of spontaneous settlements.* London, Longman, 1975. 286 p. 728.1 DWY

"Earth's living resources: a world strategy for action now," *The Unesco Courier* (33rd yr.):3-36, May 1980.
P

East-West Center. Technology and Development Institute. *Annotated bibliography on housing and settlements for low income people: selected documents from HABITAT Forum, Vancouver, Canada, 30 May-11 June 1976.* Honolulu, Hawaii, 1976. 37 p.
728.1 EAS

East-West Environment and Policy Institute, 1980-81. Honolulu, East-West Center, 1980. 35 p.
v.f.

"Echoes from our noisy world," *The Unesco Courier* (20th yr.):22-25, July 1967.
P

Eckholm, Erik P. *Losing ground: environmental stress and world food prospects.* New York, Norton, 1976. 223 p.
338.19 E191

______. *The picture of health: environmental sources of disease,* [report] jointly sponsored by Worldwatch Institute and the United Nations Environmental Programme. New York, W.W. Norton, 1977. 256 p.
614 E19p

Educational Research Council of America. *Technology: promises and problems.* Boston. Allyn and Bacon [1972] 154 p. (*Challenges of our time*)
600 ERC

Ehrlich, Paul R. and others. *Ecoscience: population, resources, environment.* San Francisco, W.H. Freeman, 1977. 1051 p.
301.31 E33c

______. *Human ecology: problems and solutions.* San Francisco, Freeman, 1973. 304 p.
301.31 E33h

______ and Richard L. Harriman. *How to be a survivor.* London, Pan 1 Ballantine [c1971] 177 p.
301.31 E33h

______. "The population resource environment crisis," in Workshop on New Horizons in Population Education, Tokyo, Japan, 5-8 June 1973. *Proceedings.* Tokyo, IPPF Western Pacific Regional Office, 1973. p. 67-75.
ASIA P370.6 I64n

______ and others. *Population, resources, environment: issues in human ecology.* 2d ed. San Francisco, Freeman [c1972] 509 p.
301.31 E33p

Ellyard, P. "World Environment Day," *Papua New Guinea Education Gazette* 12(5):140-142, June 1978.
P

Emergency shelter for disaster housing (Videotape) Honolulu, East-West Center Technology and Development Institute, 1976. 1 reel (5 in.)

Contents: *Sulphur block,* 19 min.; *Children in human settlements,* 12 min.
VT 4 728 EME

Engineering design handbook environment series, pt. 1. Basic environmental concepts. Washington, D.C., U.S. Army Material Command, 1969. 1 v.
614.7 ENG

"The environment and current economic problems," *The OECD Observer* 98:29-33, May 1979.
P

Bibliographical supplement

"Environment and development; the Founex report on development and environment," with commentaries by Miguel Ozorio de Almeida [and others]. *International Conciliation* (Carnegie Endownment for International Peace, New York) (586):1-84, January 1972. 614.7 ENV

"Environment and water resource development in Thailand," *The NEB Newsletter*:4, June 1979. P

"Environment for the children still to come," *Ideas Forum: Supplement* (2):1-3, 5, 1980. P

The environment: man on trial; an anthology of papers for the consideration of the 16th Conference of the U.S. National Commission for Unesco, Houston, 19-22 November 1972. Washington, D.C., U.S. National Commission for Unesco [1973?] 132 p. 301.31 E61

Environmental Action Coalition. *It's your environment; things to think about - things to do,* illus. by Susan Hulsman Bingham, ed. by Sherry Koehler. New York, Scribner's, 1976. 218 p. 301.31 E61i

The Environmental Center of the Philippines, Manila. *Ecosystems and environment; man and the biosphere.* 20 p. 614.7 ENV

______. *The working environment, human skills and resources.* Manila, National Media Production Centre, 1975. 8 p. (*Environmental series*, vol. 1, no. 2) 614.7 ENV

Environmental Center of the Philippines. Manila, National Media Production Center, 1974. 29 p. c.f.

"Environmental guidelines for developing coastal tourism; draft discussed at the recent meeting in Paris sponsored by the United Nations Environment Programme," *Design Incorporating Indian Builder* 23(11):19-22, November 1979. P

"Environmental policy in Japan: an on-the-spot examination," *The OECD Observer* (84):8, November-December 1976. P

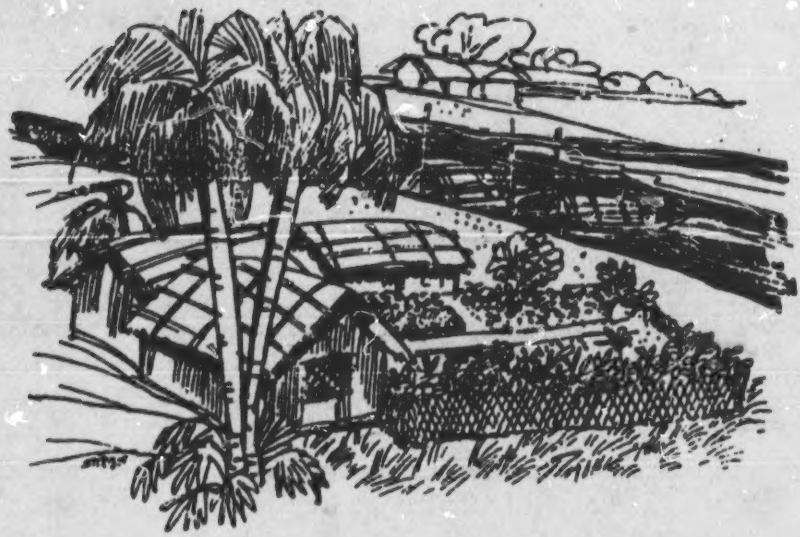
ESCAP Regional Conference on Human Settlements, Bangkok, 9-14 May 1977. *Human settlements in the ESCAP region; report.* Bangkok, ESCAP, 1977. 20 p. 301.31 ESC

ESCAP/UNEP Expert Group Meeting on Human Settlements Technology, Bangkok, 24-28 July 1978. *Seminar and country papers.* Bangkok, ESCAP, 1978. 1 v. (various papers) mimeo. 614.7 ESC

______ Regional Seminar on Alternative Patterns on Development and Lifestyles in Asia and the Pacific, Bangkok, 14-18 August 1979. *An empirical overview of environment and development: Asia and the Pacific; overview paper,* by the Asian and Pacific Development Institute. Bangkok, 1979. 394 p. 614.7 ESC

Etzioni-Halevy, Eva and Amitai Etzioni. *Social change: sources, patterns and consequences.* 2nd ed. New York, Basic Books [1973] 559 p. 301.243 ETZ

Eugenics Society 8th Symposium, London, 1971. *Population and pollution; proceedings,* ed. by Peter R. Cox and John Peel. London, Academic Press [1972] x, 163 p. 301.31 E87p



Ewald, William R., Jr., ed. *Environment and change; the next fifty years; based on papers commissioned for the American Institute of Planners' two year consultation, Part II: the Washington Conference, 1-6 October 1967.* Bloomington, Indiana University Press [c1968] 397 p. 301.31 E94e

Expert Group Meeting on Environmental Studies and Development, Pattaya, Thailand, 14-19 October 1974. *Final report.* Bangkok, U.N. Asian Institute for Economic Development and Planning, 1975. 24 p. mimeo. 614.7 EXP

Firouz, Eskandar. "Environmental and nature conservation in Iran," *Environmental Conservation* 3(1):33-42, Spring 1976. P

First International Conference on Environmental Future, held in Finland from 27 June to 3 July 1971. *The environmental future: proceedings.* London, Macmillan [c1972] 660 p. 301.31 F779e 614.7 POL

First Regional NGOs Seminar on Asian Environment, Tokyo, 1979. *Kogai: Newsletter from Polluted Japan* 7(3, 4):1-79, July-December 1979 (Series no. 22) c.f.

Food and Agriculture Organization of the United Nations (FAO). *Food and environment: reconciling the demands of agriculture with global conservation.* Rome, 1976. 44 p. 641.7 FAO

"Forging tools in the regions," *Vision Habitat News* 1(3):1-6, June 1978. P

Forrester, Jay W. *World dynamics.* 2d ed. Cambridge, Mass., Wright-Allen Press, 1973. 144 p. 301.32 F731w

Fradier, Georges. *About the quality of life,* Paris, Unesco, 1976. 66 p. Also in French: *A propos de la qualité de la vie.* 614.7 UNE

Fradier, Georges. "Habitat and the quality of life," *The Unesco Courier* (29th yr.):4-9, June 1976. P

Francis, John and Paul Abrecht, ed. *Facing up to nuclear power.* Edinburgh. The Saint Andrew Press, 1976. 244 p.

Freeman, S. David. *Energy the new era.* New York, Vintage Books, 1974. 386 p.

Friedrich-Ebert-Stiftung International Forum, Tokyo, 25 November-1 December 1973. *Industrialization and environment.* Tokyo, 1973. 363 p. (*One world only. Report no. 9*) 614.7 FRI

Garlick, J.P. and R.W.J. Keay, ed. *Human ecology in the tropics.* Oxford, Pergamon Press [c1970] vii, 112 p. (*Symposia of the Society for the Study of Human Biology*, v. IX) 301.3 GAR

Gillman, John. "UNEP-the environment dimension in Asia," *Asian Environment* 1(1):6-9, 1978. P

Glens Falls City Schools. *Project survival year II: report.* Glens Falls, N.Y., 1971. 23 p. mimeo. 301.3107 G558p

Gold, Seymour M. "Social benefits of trees in urban environments," *The International Journal of Environmental Studies* 10(2):85-90, January 1977. P

Goldberg, Edward D. *The health of the oceans.* Paris, Unesco Press, 1976. 172 p. Also in French: *La santé des océans.* 614.7 GOL

Greenwood, Ned H. *Human environments and natural systems: a conflict of dominion.* North Scituate, Duxbury Press, 1973. 429 p. 614.7 GRE

Gunn, Angus M. *Habitat: human settlements in an urban age.* Oxford, Pergamon Press, 1978. 272 p. 301.31 GUN

Habitat: United Nations Conference on Human Settlements, Vancouver, 31 May to 11 June 1976. *Analysis of programmes of the organizations in the United Nations system in the field of human settlements.* [New York, United Nations] 1976. 133 p. (A/CONF.70/A/4) 301.31 HAB

_____. *Physical elements and mobilization of human resources.* [New York, United Nations] 1976. 92 p. (A/CONF.70/A/3) 301.31 HAB

_____. *Programmes for international co-operation.* [New York, United Nations] 1976. 1 v. (various paging) 301.31 HAB

Hamilton, David. *Technology, man and the environment.* London, Faber and Faber, 1973. 357 p. 614.7 HAM

Hassanyar, Amir S. "Restoration and arid and semi-arid eco-systems in Afghanistan," *Environmental Conservation* 4(4):297-302, Winter 1977. P

Hau'ofa, Epeli. *Our crowded islands.* Suva, Institute of Pacific Studies, University of the South Pacific, 1977. 36 p. 301.32 H373o

Hawley, Amos H. *Human ecology: a theory of community structure.* New York, Ronald Press, 1950. 456 p. 301.31 H396h

Hay, Colin G. "Science, environmentalism and the public," *Search* 9(11): 407-409, November 1978. P

Health and the environment. (Supplement of the *Bangkok World,* 31 July 1980). Bangkok, Post Publishing Co., 1980. 26 p. 614.7 HEA

Helfrich, Harold W., Jr., ed. *The environmental crisis; man's struggle to live with himself based on a lecture series organized by the Yale School of Forestry,* New Haven, Yale University Press [1970] 187 p. 301.31 H474e

Hellman, Hal. *Feeding the world of the future.* New York, M. Evans, 1972. 223 p. 338.19 H477f

Henson, Collins M. *Your environment: air, air pollution and weather.* Danville, Ill., Inter-state Printers and Publishers [c1971] 206 p. illus. 614.7 HEN

Hinrichs, Noel, ed. *Population, environment and people,* with foreword by Rene Dubos. New York, McGraw-Hill [c1971] 225 p. 301.31 H664p

Hjalte, Krister; Karl Lidgren [and] Ingemar Ståhl. *Environmental policy and welfare,* trans. by Curt Wells. Cambridge, Cambridge University Press, 1977. 111 p. 301.31 HJA

Holdgate, Martin W. and Gilbert F. White, ed. *Environmental issues.,* London, John Wiley, 1977. 224 p. (*SCOPE Report 10*) 614.7 HOL

Holmes, Nicholas, ed. *Environment and the industrial society.* London, Hodder and Stoughton [1976] 247 p. 338.09 HOL

How many people? a symposium. New York, Foreign Policy Association, 1973. 94 p. (*Headline series no. 218*) 301.32 H847

Hutchins, John G.B. *Transportation and the environment.* London, Paul Eleck, 1977. 106 p. (*Environmental studies*) 580.51 HUT

India. Department of Science and Technology. *The cradle of our existence; a study of earth's environment.* New Delhi, 1978. 24 p. v.f.

______. National Committee on Environmental Planning and Co-ordination. *Environmental research programme.* New Delhi, Department of Science and Technology, [1972?] 20 p. c.f.

______. ______. *Research projects, 1975-1977.* New Delhi, Department of Science and Technology, 1978. 38 p. c.f.

______. ______. *Resume of activities, 1972-1978.* New Delhi, Department of Science and Technology, 1979. [31 p.] c.f.

______. ______. *You and your environment.* New Delhi, Ministry of Information and Broadcasting, 1976. 12 p. c.f.

Integrated Hill Development Project (IHDP). Dandapakhar, Sinolhupalchok, Nepal. Kathmandu, Kali Ashram [197?] 20 p. 309.263 INT

Bibliographical supplement

International Congress on the Human Environment (HESC) Kyoto, 1975. *Science for better environment; proceedings.* Oxford, Pergamon Press, 1977. xiv, 992 p. 614.7 SCI

International Co-ordinating Council of the Programme on Man and the Biosphere (MAB) (First Session, Paris, 9-19 November 1971. *Final report.* Paris, Unesco, 1972. 65 p. (SC/MD/26) 581.5 INT

International Council of Scientific Unions. Scientific Committee on Problems of the Environment (SCOPE). Working Group on Methodology of Determination of Toxic Substances in the Environment. *Environmental pollutants: selected analytical methods (SCOPE 6),* compiled by Wilfred Gallay [and others] London, Butterworths [1975] 277 p. 614.7 INT

International Drinking Water Supply and Sanitation Decade 1981-1990 (Kit) New York, United Nations Development Programme [1981?] 1 Kit (pamphlet, poster, photo sheets) In English, French, Spanish and Arabic) K

International Meeting of Ecological Guidelines for the Use of Natural Resources in the Middle East and South West Asia, Persepolis, Iran, 24-30 May 1975. *Proceedings.* Morges, International Union for Conservation of Nature and Natural Resources, 1976. 231 p. (*IUCN publications new series, no. 34*) 339.39 INT

International Planned Parenthood Federation (IPPF). *Health, nutrition and population in human settlements,* by Fred T. Sai, ed. by Penny Kane. London, 1977. 32 p. (*IPPF occasional essay no. 5*) 614 I64h

International Union for Conservation of Nature and Natural Resources (IUCN) *World conservation strategy: living resource conservation for sustainable development* (Kit). Gland, Switzerland, 1980. 1 kit.

Contents: *Preamble and guide.- Executive summary.- World conservation strategy.- Map section.* K614.7 INT

______. Commission on Education. *Minutes of meeting.* Gland (Switzerland), 1980. 1 v. (various paging) 614.7 IUC

International Youth Federation for Environmental Studies and Conservation. *Report from visit in Sri Lanka, India, Nepal, Burma and Thailand. Spring 1977,* by Birgith Sloth. Copenhagen, 1977. 13 p. mimeo. v.f.

______. *Youth and environment 1971.* Amsterdam, 1972. 150 p. 614.7 INT

Inter-Regional Seminar, Medellin, Colombia, 15 February-1 March 1970. *Improvement of slums and uncontrolled settlements; report.* New York, United Nations, 1971. 203 p. (E.71.IV.6) 301.31 INT

Ito, Koichi. "Environmental management in the steel industry - a survey," *The International Journal of Environmental Studies* 9(4):257-267, September 1976. P

Japan. Ministry of Environmental Affairs. *Government report on forming new environmental policies.* Tokyo, 1972. 448, 18 p. (In Japanese) 301.31 J35g

Jenkins, S.H. "Water pollution control in developing countries; an overview," *Asian Environment* 1(1):22-25, 1978. P

Jocano, F. Landa. *Slum as a way of life; a study of coping behaviour in an urban environment.* Quezon City, University of the Philippines Press, 1975. 202 p. 301.36 JOC

Johnson, Brian. "Population growth and environmental expectations," *International Social Science Journal* 26(2):207-226. 1974. 301.32 J61

Johnson, Cecil E., ed. *Eco-crisis.* New York, Wiley [c1970] 182 p. charts. 301.32 J66e

Katzschner, Lutz. "Environmental conservation in China," *Taraxacum* 10(3):10-12, 1976. P

Khid Suvarnasuddhi and others. *Preliminary environmental study of the upper Khwae Noi basin.* [Bangkok] The Electricity Generating Authority of Thailand [1976? 130] p. mimeo. 614.7 KHI

Kimball, John W. *Man and nature: principles of human and environmental biology.* Reading, Mass., Addison-Wesley, 1975. xiii, 514 p. 574 KIM

Kneese, Allen V. and Charles L. Schultze. *Pollution, prices and public policy: a study sponsored jointly by Resources for the Future, Inc. and the Brookings Institution.* Washington, D.C., Brookings Institution [1975] 125 p. 614.7 KNE

______ [and others] *Economics and the environment: a materials balance approach.* Baltimore, Johns Hopkins for Resources for the Future, 1970. 119 p. charts. 301.31 K68e

Koshal, R.K. and M. Koshal. "Air pollution and tuberculosis disease mortality - a quantitative analysis (a viewpoint)," *The International Journal of Environmental Studies* 9(2):105-115, May 1976. P

Kothari, Rajni. *Environment and development [a conceptual paper presented at the] Regional Seminar on Alternative Patterns of Development and Life-Styles in Asia and the Pacific.* Bangkok, ESCAP, UNEP, 1979. 53 p. mimeo. 614.7 KOT

"Krung Ratanakosin Conservation and Development Project," *The NEB Newsletter*:6, June 1979. P

Laughlin, Charles D. Jr., and Ivan A. Brady. *Extinction and survival in human populations.* New York, Columbia University Press, 1978. 327 p. 301.24 L 374e

"Learning to come for the environment," *Ideas Forum* Supplement (2):3-4, 1980. P

Leckie, Jim and others. *Other homes and garbage, designs for self-sufficient living.* San Francisco, Siena Club Books, 1975. 302 p.

Lehmann, Gunther. "Noise and health," *The Unesco Courier,* (20th yr.): 26-27, July 1967. P

Leone, Robert A. "Some complications in the measurement of environmental control impacts: a case study of water pollution controls," *Socio-Economic Planning Sciences* 12(3):103-111, 1978. P

Lesaca, Reynaldo M. "Environmental problems in the Philippines," *Science Review* 16(3):3-9, May-June 1975. P

Levi, Lennart and Lars Andersson. *Psychosocial stress: population, environment and quality of life.* New York, Spectrum Publications, 1975. 142 p.

Liquid assets. Slimbridge, Gloucestershire, The International Waterfowl Research Bureau with grant from Unesco, 1979. 17 p. v.f.

Lohberger, C. "Conservation in Papua New Guinea," *Papua New Guinea Education Gazette* 12(10):232-235, September 1978. P

Loraine, John A. and R.D.E. Rumsey. *The death of tomorrow*, with a foreword by the Duke of Edinburgh. London, Heineman /c1972/ 376 p. 301.31 L865d

Lowenthal, David. "Tuning into the past," *The Unesco Courier*, (29th yr.):15-17, November 1976. P

Lundquist, L.J. "The comparative study of environmental politics from garbage to gold," *The International Journal of Environmental Studies* 12(2):89-97, May 1970. P

Lynch, Kevin, ed. *Growing up in cities: studies of the spatial environment of adolescence in Cracow, Melbourne, Mexico City, Salta, Toluca, and Warszawa.* Cambridge, Mass., MIT Press/Paris, Unesco, 1977. 177 p. 301.31 LYN

McCombs, Lawrence W. and Nicholas Rosa. *What's ecology?* Menlo Park, Addison-Wesley, 1973. 248 p. 574.5 MAC

McHale, John and Magda C. McHale. *Basic human needs; a framework for action, a report to the U.N. Environment Programme, April 1977.* New Brunswick, Transaction Books, 1978. 249 p. 309.2 M149b

McKnight, Allan D.; Pauline K. Marstrand and T. Craig Sinclair, ed. *Environmental pollution control: technical economic and legal aspects*, foreword by Lord Ashby. London, Allen and Unwin /1974/ 324 p. 614.7 MAC

MacNeill, Jim. "Environmental policy in transition," *The OECD Observer* (97):40-41, March 1979. P

Mahler, H. "Habitat: health and human settlements," *World Health*:2-3, May 1976. P

The Malaysian environment in crisis; selections from press cuttings. Penang, Consumers' Association of Penang, 1978. 129 p. c.f.

Man and the ecosphere; readings from Scientific American, with commentaries, by Paul R. Ehrlich and others. San Francisco, Freeman, 1971. viii, 307 p. 301.31 M266

"Man belongs to the earth, Unesco's international programme for the national use and conservation of the biosphere," *The Unesco Courier* (33rd year):4-6, April 1980. P

Marden, Parker G., and Dennis Hodgson, ed. *Population, environment and the quality of life.* New York, AMS Press, 1975. 328 p. 301.31 M322p

Martin, A.E. "Habitat and health," *World Health*:4-9, May 1976. P

Meadows, Dennis L. and Donella H. Meadows, ed. *Toward global equilibrium: collected papers*. Cambridge, Mass., Wright-Allen Press, 1973. 353 p. 301.32 M482t

Meadows, Donella H. and others. *The limits to growth; a report for the Club of Rome's Project on the Predicament of Mankind*. London, Earth Island, 1972. 205 p.

Meher-Homji, V.M. "Role of anthropogenic factors on the vegetation of India," *Journal of Indian Education* 2(4):30-46, November 1976. P

Mehta, R.S. "Air pollution problem in India," *Asian Environment* 1(1): 26-28, 1978. P

Mena, Marino M. "Environmental quality: implications to civil engineering education in the Philippines," *Journal of Engineering in Southeast Asia* 6(7):57-62, April 1976. P

Mercado, Benjamin. "Strengthening the programme on public understanding of science and technology on environmental issues," *Science Club Reporter* 7(2):9-13, January-May 1977. P

Michelson, William, ed. *Behavioural research methods in environmental design*. Stroudsburg, Pa., Dowden, Hutchinson and Sons [1975]. 307 p. (*Community development series, no. 8*) 728 MIC

Micklin, Michael. *Population, environment, and social organization: current issues in human ecology*. Hinsdale, Ill., Dryden Press, 1973. 509 p. 301.32 M625p

Miller, G. Tyler, Jr. *Living in the environment: concepts, problems and alternatives*. Belmont, Cal., Wadsworth Publishing Co., 1975. [593] p. 301.3107 M6481

Miraflores, Salvador G. "Environmental disturbances from agricultural advances," *The Modern Teacher* XXV(5):236-237, October 1977. P

Mossman, Sue Lee and Archie S. Mossman. *Wildlife utilization and game ranching; report on a study of recent progress in this field in Southern Africa*. Morges, Switzerland, International Union for Conservation of Nature and Natural Resources, 1976. 99 p. 639.9 MOS

Murrel, K.F.H. *Ergonomics: man in his working environment*. London, Chapman and Hall, 1975. xix, 496 p. 620.82 MUR

Nepal. Ministry of Forest. Department of Land and Water. *Department of Land and Water; introductory booklet*. Kathmandu, 1974-78. 1 v. (various paging) v.f.

New Zealand. National Commission for Unesco. *Man and the Biosphere reports:*

No. 2. Robertson, B.T., K.F. O'Connor and B.P.J. Molloy. *Prospects for New Zealand biosphere reserves*. Canterbury, N.Z., published for New Zealand National Commission for Unesco and Development of Lands and Survey, by Tussock Grasslands and Mountain Lands Institute, Lincoln College, 1979. 78 p. 581.5 ROB

No. 5. Cant, Garth and Kevin O'Connor, ed. *Science in a rural community; a report on the Kurow 1977 MAB Seminar.* Canterbury, N.Z., published for New Zealand National Commission for Unesco, by the Tussock Grasslands and Mountain Lands Institute, Lincoln College, 1979. 26 p. c.f.

Oberlander, H. Peter, ed. *Improving human settlements: up with people, a series of lectures delivered at the University of British Columbia, United Nations Conference on Human Settlements: Habitat 76.* Vancouver, University of British Columbia Press, 1976. 198 p. 301.3 0121

Odum, Eugene P. *Fundamentals of ecology.* 3rd. ed. Philadelphia, W.B. Sauders, 1971. 574 p., illus. 574.5 ODU

Odum, William E. *Ecological guidelines for tropical coastal development.* Morges, Switzerland, International Union for Conservation of Nature and Natural Resources, 1976. 60 p. (*IUCN Publications new series, no. 42*) 339.49 ODU

Olembo, R.J. "Environmental issues in current food production, marketing and processing practices," in *The World Food Conference of 1976, Iowa State University, 27 June-1 July 1976 Proceedings.* Ames, Iowa State University, 1977. p. 145-162. 338.19 W927p

One Week National Media Seminar on Environmental Awareness, jointly sponsored by Press Institute of Bangladesh, Bangladesh Environment Pollution Control Board and The United Nations Environmental Programme for Asia and the Pacific Region, Dacca, 5-11 January 1979. *Report and recommendations.* Dacca, 1979. 23 p., mimeo. c.f.

Oppenheimer, Valerie K. *Population.* New York, Foreign Policy Association, 1971. 95 p. (*Headline series no. 206*) 301.32 062p

Organization for Economic Co-operation and Development (OECD), Paris. *The cost and effectiveness of automotive exhaust emission control regulations.* Paris, 1979. 94 p. 614.7 OECD

_____. *Energy and environment: methods to analyse the long-term relationship/Energie et environnement: méthodes d'analyse des relations à long terme.* Paris [1974] 391 p. 333.9 OECD

_____. *Environment policies for the 1980s.* Paris, 1980. 110 p. 614.7 OECD

_____. *Environmental policies in Japan.* Paris, 1977. 94 p. 614.7 OECD

_____. *Macro-economic evaluation of environmental programmes.* Paris, 1978. 194 p. 614.7 OECD

_____. *Pollution charges in practice.* Paris, 1980. 118 p.

_____. *Problems of environmental economics; record of the Seminar, June 1971.* Paris, 1972. 278 p. 301.31 028p

_____. *The state of the environment in OECD member countries.* Paris, 1979. 177 p. illus. 614.7 OECD

Organization for Economic Co-operation and Development (OECD), Centre for Educational Research and Innovation, Paris. *Health, higher education and the community; towards a regional health university: report of an International Conference at OECD Paris, 15-18 December 1975.* Paris, 1977. 350 p.

Also in French: *Santé, enseignement supérieur et collectivité; vers une université régionale de santé: rapport de la conférence internationale qui s'est tenue à l'OCDE, Paris, 15-18 décembre 1975.* Paris, 1977. 384 p.

613.07 OECD

______. Consultative Group on Transportation Research. *Urban traffic noise: strategy for an improved environment, report.* Paris, 1971. 165 p.

614.7 OECD

______ Conference on Noise Abatement Policies, Paris, 7-9 May 1980. *Noise abatement policies, report.* Paris, OECD, 1980. 390 p.

614.7 OECD

______/ECMT Seminar on Urban Transport and the Environment, Paris, 10-12 July 1979. *Urban transport and the environment.* Paris, OECD/European Conference of Ministers of Transport /1979/ 4 v.

Contents:- I. Background reports, -II. Case studies, -III. Case Studies, -III. Overview, -IV. Conclusions.

380.51 OECD

O'Rorke, G.B. "Environmental problems in Hong Kong," *Journal of Engineering Education in Southeast Asia,* 6(7):40-48, April 1976. P

Ostwald, Peter. "Psychoanalysis of sound," *The Unesco Courier* 29th yr.: 30-32, November 1976.

P

Oza, G.M. "Need for environmental centres," *University News* 15(12):324, June 1977.

P

Parikh, Jyoti K. "Environmental problems of India and their possible trends in the future," *Environmental Conservation* 4(3):189-198, Autumn 1977.

P

Patricios, N.N. "The environmental perception and behavioural approach in planning," *The International Journal of Environmental Studies* 9(3):199-208, July 1976.

P

Pausacker, Ian. *Recycling; is it the solution for Australia?* Harmondsworth, Middlesex, 1975. 169 p.

Pearson, Charles /and/ Anthony Pryor. *Environment: north and south; an economic interpretation.* New York, Wiley, 1978. xiv, 355 p.

614.7 PEA

"PHILAAS Seminar - Workshop on Science and Environment," *Science Club Reporter* 7(2):5; January-May 1977.

P

Philippines. Ministry of Human Settlements. *The concept of human settlements.* Manila, 1979. 26 p. mimeo.

301.31 PHI

______. ______. *Realising the vision of a new society; national multi-year human settlements plan 1978 to 2000.* Manila, 1978. 194 p.

301.31 PHI

Philippines. Ministry of Human Settlements. *Work programmes for human settlements.* Manila, 1979. 23 p. mimeo. 301.31 PHI

______. University. Science Education Center, Quezon City. *Making a water-sealed toilet.* Diliman, Quezon City, 1978. 51 p. 614.7 PHI

Poirot, Eugene M. *Our margin of life.* Raytown, Mo., Acres, USA, 1978. 139 p. 614.7 POI

"Pollution study in the Gulf of Thailand," *AIT Review* 17(4):10, October 1978. P

"Pollution - the number-1 problem," *The Unesco Courier,* (27th yr.):35-37, January 1969. P

Poore, Duncun. *Ecological guidelines for development in tropical rain forests.* Morges, Switzerland, International Union for Conservation of Nature and Natural Resources, 1976. 39 p. 574.5 POO

Population crisis: an interdisciplinary perspective, ed. by Sue Titus Reid /and/ David L. Lyon. Glenview, Scott, Foresman /c1972/ 220 p. 301.32 P831

Poulsen, Gunnar. *Man and tree in tropical Africa; three essays on the role of trees in the Africa environment.* Ottawa, International Development Research Centre, 1978. 31 p. 614.7 POU

Poulton, E.C. "A new look at the effect of noise: a rejoinder," *Psychological Bulletin* 85(5):1068-1079, 1978. P

Prichard, D.C. *Environmental physics; lighting.* London, Longman /c1969/ 96 p. 729.28 PRI

"The problems and science of human settlements," *Ekistics* 41(242), January 1976. 728.1 PRO

Ramana, D.V. *An overview of environment and development of Asia and the Pacific.* Bangkok, United Nations Asian and Pacific Development Institute, 1980. 325 p. 614.7 RAM

Resources, environment and population: the nature of future limits," *Population Bulletin* 34(3), August 1979. 42 p. P

Revelle, Roger. *Population and environment.* Cambridge, Mass., Harvard Center for Population Studies, 1974. 29 p. (*Research paper series no. 4*) 301.31 R451p

______ and others, ed. *The survival equation; man, resources, and his environment.* Boston, Houghton, 1971. 508 p. 301.31 R451s

Ridker, Ronald G. and William D. Watson. *To choose a future: resource and environmental consequences of alternative growth paths.* Baltimore, Johns Hopkins University Press published for Resources for the Future, 1980. 463 p. 301.31 R544t

Robertson, B.T., ed. *Prospects for New Zealand biosphere reserves.* Canterbury, published for the New Zealand National Commission for

Unesco and Department of Lands and Survey, by Tussock Grasslands and Mountain Lands Institute, 1979. 78 p. (*New Zealand Man and the Biosphere report, no. 2*) 581.5 ROB

Robinson, T.P. *The effects of weapons on ecosystems.* Oxford, Pergamon Press for United Nations Environment Programme, 1979. 70 p. (*UNEP Studies, 1*) 574.5 ROB

Rolliman, Jonathan. *The ecology of world development.* London, Voluntary Committee on Overseas Aid and Development, 1972. 32 p. 301.32 H739e

Romm, Jeff. *Higher education and natural resources management in Southeast Asia.* Washington, D.C., Overseas Liaison Committee. American Council on Education, 1978. 47 p. (*Overseas Liaison Committee paper, no. 13*) 614.707 ROM

Rossano, August T., ed. *Air pollution control: guidebook for management,* New York, McGraw-Hill [1974] 213 p. 628.53 ROS

Saarinen, Thomas F. *Environmental planning: perception and behaviour.* Boston, Houghton Mifflin, 1976. xiii, 262 p. 614.7 SAA

Sandbach, F. "A further look at the environment as a political issue," *The International Journal of Environmental Studies,* 12(2):99-110, May 1978. P

Sassan, Albert. *Développement et environnement: faits et perspectives dans les pays industrialisés et en voie de developpement.* Paris, Mouton [1974] 423 p. 614.7 SAS

Sauvy, Alfred. "Population and environment," in USSP. *Population growth and economic development in the Third World.* Dolhain, Belgium, 1976. p. 677-706. 301.32 I61p

______. *Zero growth.* New York, Praeger, 1975. 266 p. Translation of *Croissance zero?* by Maguire. 301.31 S262z

Schafer, Murray. "Exploring the new soundscape," *The Unesco Courier* (29th yr.):4-8, November 1976. P

Schumacher, E.F. *Small is beautiful; a study of economics as if people mattered.* London, Sphere Books, 1974. 255 p. 330.9 SCH

Second International MAB/IUFRO Workshop on Tropical Rainforest Ecosystems, Jakarta, 21-25 October 1978. *Final report,* ed. by S. Adisoemarto and E.F. Brunig. Reinbek, Hamburg, 1979. 295 p. 614.7 INT

Seminar on Modernisation and the Environment, organised jointly by the Penang Branch of the Malayan Nature Society and the Consumers Association of Penang, Dewan Sri Pinang, Penang, 30-31 March 1974. *Battle for the environment, the Malaysian experience; proceedings of the Seminar,* ed. by Lim Wah Ching and Ravinder Singh. Penang, Consumers' Association of Penang, 1974. 90 p. 614.7 SEM

Seminar/Workshop on Science and Environment, 25th Anniversary Convention, The Philippine Association for the Advancement of Science, Manila, 27-29 October 1976. *Proceedings [of Seminar-Workshop]* Manila, 1976. 702 p. 507.2 SEM

"Seminars on Environmental Engineering," *Bulletin of the Regional Office of Science and Technology for Africa* 13(3):19-20, July-September 1978. P

"Sensory Environment," *Building Technology Project Summaries* 1976: 32-36, 1977. P

Setamanit, Surin. "Thailand national report on environmental training for practising civil engineers," *Journal of Engineering Education in Southeast Asia* 6(7):69-73, April 1976. P

Setia Adi, Dadi and Kusmadji Wirjosumarto. *[Man and his environment]* Bandung, Lembaga Penelitian Pendidikan Kependudukan, IKIP, 1972. 75 p. (In Indonesian) Cover title: Manusia Dan Lingkungunnya. 301.31 S495m

Shin, Eung-Bai. "Environmental qualities of the Republic of Korea," *Journal of Engineering Education in Southeast Asia* 6(7):63-65, April 1976. P

Singapore. Ministry of the Environment. *Annual reports 1979-* Singapore, 1980- 1 v. c.f.

Slater, R. Ginseppi and others. *The earth belongs to the people: ecology and power,* 5th ed. San Francisco, Peoples Press, 1976. 45 p. v.f.

Slesnick, Irwin. *Biology of reproduction in human population; working [paper]* prepared for Unesco Regional Conference of Science Teaching - SCT, Unesco, 15 September 1972. [Paris, Unesco, 1973?] 173 p. 574.16 SLE

Smith, Jack. "The Government fights vs. pollution," *The Modern Teacher* XXVII(6):289, November 1979. P

Smithsonian Institution Symposium, Washington, D.C., 16-18 February 1967. *The quality of man's environment.* Washington, D.C., Voice of America, 1968. 250 p. (*Voice of America forum lectures*) 614.7 SMI

Sommer, Robert. *Personal space: the behavioural basis of design.* Englewood Cliffs, N.J., Prentice-Hall, 1969. xi, 177 p. 581.5 SOM

______. *Tight spaces: hard architecture and how to humanize it.* Englewood Cliffs, N.J., Prentice-Hall, 1974. 150 p. 720 SOM

South Asia Co-operative Environment Programme Inter-Governmental Expert Group Meeting, Bangalore, India, 10-15 March 1980. *Report* /*of the Meeting*/ Bangkok, UNEP Regional Office for Asia and the Pacific, 1980. 1 v. (various paging) 614.7 SOU

Span of man, report of a Colloquium, organized by the German Commission for Unesco in co-operation with the Faculty of Biology of the University of Freiburg, 23-24 May 1974. Munchen, Deutsche Unesco-Kommission, 1975. 248 p. 574.5 SPA

"The state of the environment," *OECD Observer*, no. 98, May 1979. P

Steadman, Philip. *Energy, environment and building.* Cambridge, Cambridge University Press, 1977. ix, 287 p. illus. (*Cambridge urban and architectural studies, 2*) 697 STE

Sterling, Elia M. "Pollution in public buildings," *Journal of Architectural Research* 6(2):13-19, August 1977. P

Stern, Arthur C. and others. *Fundamentals of air pollution.* New York, Academic Press, 1973. 492 p. 614.71 STE

Suhaimi, Ariffin. *Environmental control by legislation (Malaysia as a case study)* Serdang, Selangor, 1980. 30 p. 614.7 SUH

Suriyakumaran, C. "Environment and development planning," *Marga Quarterly Journal* 4(1):3-13, 1977. P

______, ed. *Environmental assessment statements; a test model presentation.* Bangkok, Regional Office for Asia and the Pacific UNEP, and UNAPDI, 1980. 235 p. 614.7 SUR

Swedish Council for Building Research. *Air movements: the dispersion of pollution: exploratory tests using IR techniques*, by C. Allarder and Bengt Ljungquist. Stockholm, 1979. 8 p. 614.71 SWE

______. *Environmental simulating methods and public communications*, by Carl-Axel Acking, Christer Ohlsson and Ulf Sjogren. Stockholm, 1976. 57 p. 771.53 SWE

Swedish Society for Town and Country Planning, Malmo, Sweden. *Plan International Habitat 76.* Malmo, 1976. 224 p. 301.31 SWE

Sweeny, S.B.I. "Health from the living soil," *The International Journal of Environmental Studies* 12(1):27-28, March 1978. P

Symposium on Population Resources and Environment, Stockholm, 26 September-5 October 1973. *Report and background paper of the World Population Conference, Bucharest, Romania, 19-30 August 1974.* New York, United Nations, 1974. 35 p. (E/CONF.60/CBP/3) v.f.

Taub, F.B. "Demonstration of pollution effects in aquatic microcosms," *The International Journal of Environmental Studies* 10(1):23-33, November 1976. P

Thacher, Peter S. "The United Nations Environment Programme and the ecological world," *Environmental Conservation* 5(4):242-246, Winter 1978. P

Thailand. Committee on Environmental Quality Control. *Environmental problems in Thailand, a national report for presentation at the United Nations Conference on the Human Environment, Stockholm 5-16 June 1972.* [Bangkok, Applied Scientific Research Corporation of Thailand] 1972. 38 p. mimeo. 614.7 THA

______. Office of the National Environment Board. Environmental Impact Evaluation Division. *General guidelines for preparation of environmental impact statements for review by NEB.* Bangkok, 1978. 19 p. mimeo. c.f.

______. ______. ______. *Supplemental guidelines for preparation of environmental impact statements for review by NEB: dam and reservoir projects.* 12 p. mimeo. c.f.

Thailand National Seminar on Protection of the Marine Environment and Related Eco-systems, Bangkok, 26-28 June 1979. *Proceedings.* Bangkok, Office of the National Environment Board, 1979. 294 p. mimeo. 614.7 THA

Theobold, Robert. *The challenge of a decade, global development or global breakdown/L'enjeu d'une décennie pour le monde: développement ou faillite.* New York, United Nations Centre for Economic and Social Information, 1980. 32 p. v.f.

Thirteenth National Conference of the U.S. National Commission for Unesco, San Francisco, 23-25 November 1969. *Man and his environment: a view toward survival, background book [of the] Conference.* Washington, D.C., U.S. National Commission for Unesco, [1969] 1 v. (various pagings) 614.7 NAT

Tinker, Irene and Mayra Bavinie, ed. *The many facets of human settlements: science and society, papers prepared for AAAS activities in connection with Habitat: the UN Conference on Human Settlements.* Oxford, Pergamon Press, 1977. 405 p. 301.31 TIN

Toffler, Alvin. *The eco-spasm report.* New York, Bantam Books, 1975. 116 p.

______. *Future shock.* London, Pan Books, 1970. 517 p. 309 TOF

Troost, Dirk G. *Speech delivered in "MAB Child and Environment Seminar, Kuala Lumpur, 22-24 November 1979,"* Jakarta, Unesco Regional Office for Science and Technology for Southeast Asia, 1979. 3 p. v.f.

Turner, John F.C. "A new universe of squatter-builders," *The Unesco Courier* (29th yr.):12-14, June 1976. P

Udvardy, Miklos D.F. *A classification of the biogeographical provinces of the world.* Morges, Switzerland, International Union for Conservation of Nature and Natural Resources, 1975. 48 p. (*IUNCN occasional paper, no. 18*) 574.5 UDV

U.K. Department of the Environment. Department of Transport. *Register of research 1977.* London, 1977. 2 v. 614.7 U.K.

______. Royal Commission on the Environmental Pollution. *Nuclear power and the environment; presented to Parliament by command of Her Majesty, 6th report.* London, H.M.S.O., 1976. 237 p. 614.7 U.K.

UNAPDI and UNEP Consultative Meeting on Methodology and Techniques for Identification and Incorporation of Environmental Dimensions in Development Planning, Bangkok, 14-16 February 1979. *Report*. Bangkok, United Nations Asian and Pacific Development Institute (UNAPDI)/ United Nations Environment Programme (UNEP), 1979. 46 p. mimeo.
614.7 UNA

______. Background paper I: *Status of environmental protection legislation in the ESCAP region*, by Environmental Co-ordinating Unit, ESCAP.

______. Background paper II: *Table of national environmental legislation in the ESCAP region*, by Environmental Co-ordinating Unit, ESCAP.

______. Background paper III: *Activities in environment of United Nations Asian and Pacific Development Institute*, by Jean-Claude Leyrat.

______. Working paper V: *A case study of the Pa Mong Project; environmental aspects*, by V.R.Pantulu.

______. Working paper VII: *Khao Yai Project: Terrestial resources development*, by S. Piampongsant and Jean-Claude Leyrat.

______. *Proceedings*. 304 p. 614.7 UNA

UNEP: What it is, What it does, How it works. Nairobi, UNEP /1980/ 1 foldout. v.f.

Unesco, Paris. *Environmental physiology and psychology in arid conditions; proceedings of the Lucknow Symposium, 7-13 December 1962*. Paris, 1964. 400 p. (*Arid Zone Research, No. 24*) Also in French: *Physiologie et psychologie en milieu aride; actes du colloque de Lucknow, 7-13 décembre 1962*.
333.73 UNE

______. *Human population problems in the biosphere: some research strategies and designs*, ed. by Paul Baker. Paris, 1977. 82 p. (*Man and the biosphere (MAB) technical notes 3*) 301.31 U56h

Unesco. *Man and his environment: an overview of Unesco's involvement.* Paris, 1979. 65 p. Also in French: *L'homme et son environnement: apergu de l'action de l'Unesco.* 69 p. 614.7 UNE

______. Man and the Biosphere (MAB) Programme. *Technical notes* [series], prepared in co-operation with UNFPA. Paris, Unesco, 1970-
Contents:

1. *The Sahel: ecological approaches to land use*
2. *Mediterranean forests and maquis: ecology, conservation and management*
3. *Human population problems in the biosphere: some research strategies and designs*
4. *Dynamic changes in terrestrial ecosystems: patterns of change, techniques for study and applications to management*
5. *Guidelines for field studies in environmental perception*
6. *Development of arid and semi-arid lands: obstacles and prospects*
7. *Map of the world distribution of arid lands*
8. *Environmental effects of arid land irrigation in developing countries*
9. *Management of natural resources in Africa: traditional strategies and modern decision-making*
10. *Trends in research and in the application of science and technology for arid zone development*
11. *Fire and fuel management in mediterranean-climate ecosystems: research priorities and programmes*
12. *An integrative ecological approach to the study of human settlements*
13. *Population-environment relations in tropical islands: the case of eastern Fiji*

301.31 U56h

______. Office of the Regional Advisor for Social Sciences in Asia and Oceania, Bangkok. *The social sciences in the Man and the Biosphere programme; report on seven seminars held in Asia: Bangladesh, Indid, Malaysia, Nepal, Pakistan, Philippines, Thailand.* Bangkok, 1979. 147 p. 301.3 UNE

[______] Meeting of Experts on Indicators of the Quality of Life and the Environment, 6-9 December 1977, Unesco, Paris. *Indicators of environmental quality.* Paris, 1977. 14 p. + annexes. (SS.76/CONF. 629/6)

______ Regional Meeting of Experts on Swidden Cultivation in Asia, Bangkok, Thailand, 19-23 April 1979. *Research design: a comparative study on swidden cultivation in Asia, report.* Bangkok, Unesco, 1979. 36 p. 614.7 UNE

[______] Regional Seminar on Environmental Engineering Research in Waste Management and New Technology, Lahore, Pakistan, 18-22 March 1979. *Final report [of the Seminar]* organized by Unesco in co-operation with the Institute of Public Health Engineering and Research, University of Engineering and Technology. Lahore, University of Engineering and Technology, 1979. 35 p. 14.707 UNE

[Unesco] Training Seminar in Environmental Science and Management, 8 October-3 November 1979. *Evaluation, Lecture notes, Project assignments [of Seminar]* conducted by SEAMEO Regional Centre for Tropical Biology (BIOTROP) in co-operation with the Centre for Natural Resource Management and Environmental Studies of the Bogor Agricultural University. Bogor, BIOTROP, 1979. 3 v.

Unesco/UNEP/FAO. *Tropical grazing land ecosystems, a state-of-knowledge report*, Paris, Unesco, 1979. 655 p. (*Natural resources research XVI*) 338.74 UNE

Unesco Youth Institute, Gauting. *Toward mankind's better health*. New York, Oceana Publications, 1963. 103 p. (*Study-guide series on the United Nations and related agencies*, v. 3) 614 UNE

United Nations. Secretary-General. *Population, resources and the environment*. New York, 1974. 92 p. (E/CONF.60/5) 301.3206 W927c

United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972. *Report*. New York, United Nations, 1973. 77 p. 301.31 U54r

______. *Declaration on the Human Environment...* Geneva, Centre for Economic and Social Information at United Nations, 1972. 23 p. 614.7 UNI

United Nations Environment Programme (UNEP). *Annual review, 1976- to date*. New York, 1977- v. 614.7 UNI

______. *Compendium of legislative authority, 1972-1977*. [Nairobi] 1978?] 287 p. 614.7 UNE

______. *The state of the environment*, selected topics. Geneva, 1974 to date. 614.7 UNI

______. Division of Information. *Women, environment* [foldouts]:

Women, environment and development

Women, environment and work

Women, environment and food

Women, environment and health

Women, the water carriers - and water related diseases

Women, environment and water. *v.f.*

______. Environment Liaison Centre. *Report on non-governmental organization activities on environmental issues related to UNEP programmes, prepared for the Sixth Governing Council*. Nairobi, 1978. 72 p. 614.7 UNE

______. Regional Office for Asia and the Pacific. *The environment situation and activities in the Asia-Pacific region in 1979-* Bangkok, 1980- v. 614.7 UNE

______. ______. *Environmental assessment statements, a test model presentation*. Bangkok, UNEP/UNAPDI, 1980. 235 p. 614.7 UNE

______. ______. *UNEP-ASIA-PACIFIC report; the environment situation and activities in the Asia and Pacific region*. Bangkok, 1976 to date. 614.7 UNEP

LI

United Nations Environment Programme (UNEP). Regional Office for Asia and the Pacific. "United Nations organizations supporting environmental projects in Asia and Oceania," excerpt from *UNEP-Asia report 1978.* Bangkok, Population Clearing House, Unesco, 1979. p. 23-33

______. Regional Office for Asia and the Pacific and United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Regional Seminar on Alternative Patterns of Development and Life-Styles in Asia and the Pacific, Bangkok, 14-18 August 1979. *Environment and development, final report and papers.* Bangkok, 1979. 1 v + 15 papers (DP/EDRS 1-3, 15-16) 614.7 ESC

United Nations Habitat and Human Settlements Foundation. Nairobi, The Foundation [1976?] 11 p. v.f.

Upreti, Biswa N. *Conservation of wildlife resources in Nepal.* [Kathmandu] National Parks and Wildlife Conservation Office, 1979. 18 p. c.f.

Vermally, Ashton I. "What price the environment?," *Agenda; Agency for International Development* 2(5):17-19, June 1979. P

Victor, Peter A. *Pollution: economy and environment.* London, Allen and Unwin [1972] 247 p. 614.7 VIC

Vida, Gabor. "Genetic diversity and environmental future," *Environmental Conservation* 5(2):127-132, Summer 1978. P

Vision Habitat Communication Clinic on Human Settlements, Bangkok, 5-8 February 1979. *Report and meeting papers.* Bangkok, 1979. 1 v. (various paging) 614.7 VIS

Wagner, Richard H. *Environment and man.* 3d. ed. New York, Norton and Co., 1978. 591 p. 378.54 IND

Waldron, Ingrid and Robert E. Ricklefs. *Environment and population: problems and solutions.* New York, Holt, Rinehart and Winston, 1973. 232 p. graphs. 301.31 W167e

Walters, A. Harry. *Ecology, food and civilisation.* London, Charles Knight, 1973. 216 p. 301.2 W235e

Ward, Barbara. *The home of man.* Harmondsworth, Middlesex, Penguin Books, 1976. 297 p.

______. *Progress for a small plant.* New York, Penguin Books, 1979. 305 p. 301.31 W256p

______ and Rene Dubos. *Only one earth, the care and maintenance of a small planet.* New York, Norton, c1972. 225 p. 301.31 W2560

What kind of world are we leaving our children? Paris, Unesco, 1978. 176 p. 362.7 Une

"Where have all the forests gone?" *Newsweek*:45-48, 6 October 1980. P

Whyte, Anne. "The role of environmental perception research," *Nature and Resources* 13(4):19-21, October-December 1977. P

Wilson, Thomas W., Jr: "Environment and population," in *How many people?; a symposium.* New York, Foreign Policy Association, 1973. p. 7-15 *(Headline series no. 218)* 301.32 H847

Workshop in Environmental Planning and Assessment, Papua New Guinea, 16 January-3 March 1978. *Report.* Noumea, New Caledonia, South Pacific Commission, 1978. 19 p. 614.7 WOR

Workshop on Land Use Impacts on Lake and Reservoir Ecosystems; MAB Projects, Warsaw, 26 May-2 June 1978. *Proceedings [of the Workshop]* ed. by N. Duncan and J. Rzoska Wein, Facultas-Verlag, 1980. 294 p. (*Programme on Man and Biosphere*) 614.7 WOR

World Bank, Washington, D.C. *Environment and development.* Washington, D.C., 1975. 33 p. 614.7 WOR

_____. *Environmental health and human ecologic considerations in economic development projects.* Washington, D.C., 1974. ix, 142 p. 614.7 WOR

Worldwatch Institute, Washington, D.C. *The Worldwatch paper series:*

no. 1. *The other energy crisis: firewood,* by Erik Eckholm. 301.31 W927o
no. 4. *Energy: the case for conservation,* by Denis Hayes. 301.31 W927e
no. 5. *Twenty-two dimensions of the population problem,* by Lester R. Brown, Patricia L. McGrath, and Bruce Stokes. 301.31 W927t
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Zamora, Generoso D. "Let's open our eyes to nature," *The Philippine Journal of Education* 55(8):404-405, January 1977.
P

Atlases

Atlas of earth resources. London, Mitchell Beazley, 1979. 208 p.
R912 ATL

Atlas of world water balance, prepared by the /USSR/ State Hydrological Institute. Paris, Unesco/Leningrad, Hydrometeorological Publishing House, 1977. 65 maps; 1 booklet.
R551.4 ATL

Bibliographies

Block, Donn. *Environmental aspects of economic growth in less developed countries: an annotated bibliography.* Paris, OECD Development Centre, 1973. 111 p.
614 BLO

Buick, Barbara, comp. *Squatter settlements in developing countries: a bibliography.* Canberra, Australian National University Press, 1975. 158 p. (Research School of Pacific Studies. *Aids to research series, no. A/3*)
301.31 BUI

East-West Center. Technology and Development Institute. *Annotated bibliography on housing and settlements for low-income people: selected documents from HABITAT Forum, Vancouver, Canada, 30 May-11 June 1976.* Honolulu, 1976. 37 p.
R728.1 EAS

Lieber, J.W., comp. *Human ecology and education; a catalogue of environmental studies, 1957-1970.* Ibadan, 1970. 46 p. (University of Ibadan, Institute of Education. *Occasional publication, no. 10*)
301.3 LIE

Lockard, J.D.; Jack Wheatley and Emmett Wright, comp. "World trends in environmental education/Tendances mondiales de l'éducation relative à l'environnement," *Educational Documentation and Information, Bulletin of the International Bureau of Education,* Year 50(200):9-77, 3rd quarter 1976.
P

Malaysia. Universiti Sains, Penang. Library. *Bibliografi alam sekitar/Bibliography on the environment.* Penang, 1980. viii, 213 p. *(Bibliographical series, no. 25)*
R614.7 MAL

National Science Teachers Association, Washington, D.C. *Environmental education materials; a catalog of reviewed and evaluated free and low-cost materials for science, social studies, and industrial arts,* edited by John H. Woodburn. Washington, D.C. 1975. 12 p.
R614.707 NAT

Stapp, William B. and Mary Dawn Liston, comp. *Environmental education: a guide to information sources.* Detroit, Gale Research Company, 1975. xiii, 225 p.
614.7 STA

Unesco. *Threat of modern warfare to man and his environment; an annotated bibliography,* prepared under the auspices of the International Peace Research Association (IPRA). Paris, 1979. 25 p. (Unesco. *Reports and papers in the social sciences 40)*
614.7 UNE

Unesco. Regional Office for Education in Asia and Oceania. Population Education Clearing House. *Building your population education collection.* Bangkok, 1980. 8 v. P029.9 U56b

______. ______. ______. *Population education accessions lists. . .* Bangkok, 1978- ROP16 U56P

______. ______. ______. *Population education as integrated into development programmes: a non-formal approach: abstract bibliography.* Bangkok, 1980. 1 folder in 7 parts. R

United Nations. Audio-Visual Information Centre on Human Settlements, Bangkok. *Vision habitat; regional film catalogue (Asia/Pacific)* Bangkok, 1979? 1 v. (various paging) R301.31 UNI

United Nations Environment Programme, Nairobi. Library and Documentation Centre. *Library bulletin: list of new acquisitions 1977 to date.* R

U.S. Department of Housing and Urban Development. Office of International Affairs. *Children in the built environment; a bibliography* [Washington D.C.] 1979. 21 p. R301.31 USA

Dictionaries and Encyclopedias

Encyclopedia of Environmental science. New York, McGraw-Hill, 1974. 754 p. R574.5 ENC

Studdard, Gloria, J., comp. *Common environmental terms; a glossary.* Washington, D.C., U.S. Environmental Protection Agency, 1974. 23 p. R574.52 STU

Torrie, Arthur. *Illustrated glossary of environmental and ecological terms.* Singapore, Heinemann Educational Books, 1977. 82 p. R574.52 TOR

Directories and other reference works

Australian National Commission for Unesco. *A directory of tertiary and postgraduate environmental studies courses in the Asia-Oceania region,* by David Ingle Smith. *An analysis of Australian course-work masters degrees in environmental studies, 1972-1979,* by David Ingle Smith and E.H.M. Ealey. Canberra, Australian Government Publishing Service, 1980. 53 p. R614.707 AUS

International directory of individuals involved in environmental education. Paris, Unesco, 1977. 120 p. (Unesco-UNEP International Environmental Education Programme)
R614.707 INT

International directory of institutions active in the field of environmental education. /Paris/ Unesco, 1977. 111 p. (Unesco-UNEP International Environmental Education Programme) Also text in French and Spanish
R614.707 INT

Washington (State). Department of Ecology. *A student's guide to environmental discovery.* /Olympia, 1974/ 37 p.
W319 A

World directory of environmental education programs; post-secondary study and training in 70 countries, prepared by International Institute for Environmental Affairs in co-operation with the Institute of International Education, ed. by Philip W. Quigg. New York, R.R. Bowker Co., 1973. xiii, 289 p.
R614.7 WOR

World directory of environmental organizations, edited by Thaddeus C. Trzyna and Eugene V. Coan in co-operation with the International Union for Conservation of Nature and Natural Resources. 2d. ed. Claremont, Calif., Public Affairs Clearinghouse for the International Program of the Sierra Club, 1976. xxx, 258 p.
R614.7 TRZ

Periodicals

Title	Publisher, Address
Asian and Pacific Population Programme News	Division of Population and Social Affairs ESCAP, United Nations Building Rajadamnern Ave., Bangkok 2, Thailand
Asian Environment	ASEAN Journals Ltd., 3rd floor, KLM Building 2-18 Patpong Road, Bangkok, Thailand
CONNECT: Unesco-UNEP Environmental Education Newsletter	Unesco 7 Place de Fontenoy, 75700 Paris, France
Environment and Policy	East-West Environment and Policy Institute East-West Center, 177 East-West Road Honolulu, Hawaii 96848, USA
Desertification Control, Semi-Annual Bulletin on Plans and Activities	United Nations Environment Programme (UNEP) Nairobi Kenya
ECO-News: An Environmental Newsletter for Young People	Environmental Action Coalition 156 Fifth Avenue, Suite 1130 New York, New York 10010, USA
Environment Information	UNEP Regional Office for Asia and the Pacific, UN Building, Bangkok 2, Thailand
Environment Newsletter	Regional Ecological Advisor South Pacific Commission P.O. Box D5, Noumea Cedex, New Caledonia
Environmental Sanitation Review (3 times a year)	ENSIC, Asian Institute of Technology P.O. Box 2754, Bangkok, Thailand

Title	Publisher, Address
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Inside PESAM, Newsletter of the Program on Environmental Science and Management	IEC-PESAM Human Ecology Institute Building UPLB College, Laguna, Philippines
The International Journal of Environmental Studies	Gordon and Breach Science Publishers, 42 William IV St., London W.C. 2, United Kingdom
IUCN Bulletin	International Union for Conservation of Nature and Natural Resources 1110 Morges, Switzerland
The Journal of Environmental Education	Dembar Educational Research Service, Inc. Box 1605, Madison, Wisconsin 53701, USA
Journal of Population Education	Department of Education Faculty of Social Science and Humanities Mahidol University Rajvithi Road, Bangkok 4, Thailand
Journal of Science and Mathematics Education in Southeast Asia	SEAMEO Regional Centre for Education in Science and Mathematics (RECSAM) Glugor, Penang, Malaysia
MAB News	Man and the Biosphere (MAB) Programme Unesco, 7 Place de Fontenoy 75700 Paris, France
Mazingira, the World Forum for Environment and Development	United Nations Environment Programme (UNEP) Subscription Department P.O. Box 30552, Nairobi, Kenya

Bibliographical supplement

Title	Publisher, Address
The Modern Teacher	In the Grade School, Inc. 641 P. Paterno, Quiapo Manila, Philippines
NAEP Newsletter	Directorate of Adult Education West Block 8, R.K. Puram New Delhi-110022, India
National Geographic Magazine	National Geographic Society Post Office Box 2895 Washington, D.C. 20013, USA
Nature and Resources	Unesco 7 Place de Fontenoy, 75700 Paris, France
The NEB Newsletter	Office of the National Environment Board Soi Prachasumpan 4, Rama VI Road Bangkok 4, Thailand
Newsletter [on] Environmental Conditions	Environmental Research Institute Chulalongkorn University Bangkok, Thailand
PHP Institute International Inc.	No. 32 Mori Building, 6th floor 3-4-30 Shibakoen Minato-ku, Tokyo 105, Japan
Population Education in Asia and the Pacific Newsletter	Population Education Programme Service Unesco Regional Office for Education in Asia and the Pacific G.P.O. Box 1425, Bangkok, Thailand
Report to Governments	United Nations Environment Programme (UNEP) P.O. Box 30552, Nairobi, Kenya
Sarn Singvadlom (Environment Newsletter) In Thai	Mahidol University Bangkok, Thailand
The Siren, News from UNEP's Regional Seas Programme	United Nations Environment Programme (UNEP) Palais des Nations 1211 Geneva 10, Switzerland
Uniterra	Information Service United Nations Environment Programme (UNEP) P.O. Box 30552, Nairobi, Kenya
Vision Habitat News	United Nations Audio-Visual Information Centre on Human Settlements Room E-49, Palais des Nations 1211 Geneva 10, Switzerland

Recently acquired

APCWD Training Workshop on Environmental Issues Affecting Women with Particular Reference to Housing, Community Facilities and Public Utilities, New Delhi, June 1980. *Report.* Bangkok, Asian and Pacific Centre for Women and Development, 1980. 85 p.

301.412 HSI

Asia/Pacific Tripartite Regional Seminar on Education and Training Policies and Programmes in the Field of Working Conditions and Environment, Bangkok, U.N. Service Building, 24-28 November 1980. *[Report of the Meeting]* Bangkok, International Labour Office, 1980. 1 v. (various paging) mimeo.

Bangkok, International Labour Office, 1980. 1 v. (various paging) mimeo.
331.11 ASI

Australia. Curriculum Development Centre. *Development of environmental education in Australia - Key issues.* Canberra, 1977. 103 p. (CDC Professional ser.)
614.7 AUS

______. ______. *Education and the human environment,* ed. by R.D. Linke, introd. by P.J.Fensham. Canberra, 1977. 326 p. (CDC Professional ser.)
614.7 AUS

______. ______. Study Group on Environmental Education. *Report.* Canberra, 1978. 47 p.
614.707 AUS

______. Curriculum Development Centre and the Department of Science and the Environment. *Environmental education for schools.* Canberra, Curriculum Development Centre, 1980. 22 p.
614.707 AUS

Barnet, Richard J. "A reporter at large (The world's resources): I. The lean years," *The New Yorker:* 49-79, 17 March 1980. II. "Minerals, food and water," *The New Yorker:* 40-91, 31 March 1980. III. "Human energy," *The New Yorker:* 46-115, 7 April 1980.
v.f.

Cameron, Chris and others. *Exploring outdoors, a unit from the Curriculum Development Centre's Environmental Project,* edited by Di Ward. Canberra, Curriculum Development Centre, 1980. 85 p. illus. (Environmental Education Project)
614.707 CAM

Chalermrath Khambanonda. *Thailand's public law and policy for conservation and protection of land, with special attention to forests and natural areas.* Bangkok, The National Institute of Development Administration, 1972. 187 p.
634.9 CHA

Cintaku Negeriku /posters on environment/ Djakarta, MAB Indonesia, 1980. 3 posters col.
CH

Bibliographical supplement

East Regional Workshop on Primary School Environmental Studies for In-Service Educators, Basic Training Centre, Mirga, Assam, 5-9 February 1979. *Report on phase one.* New Delhi, National Council of Educational Research and Training [1979?] 58 p. 614.707 EAS

"The environment. . .". *AIT Review* 19(3):6-7, July 1980. P

Environmental issues affecting women with particular reference to housing and human settlements, papers prepared for APCWD Workshops held in collaboration with National Buildings Organisation, New Delhi, April-June 1980. [Bangkok, Asian and Pacific Centre for Women and Development] 1980. 164 p. 301.412 ASI

Gallopin, Gilberto C. *Planning methods and the human environment.* Paris, Unesco, 1981. 68 p. 614.7

Gill, J.S. "Environmental concern - a worldwide movement," *School Science* 18(3):7-12, September 1980. P

Habitat International (Bi-monthly) Oxford, Pergamon Press, 1979- P

Jadhao, V.G. "The efficacy of teaching through environment at primary level: an experimental study," *Journal of Indian Education* 6(4):34-39, November 1980. P

Man and the environment information guide series, edited by Seymour M. Gold. Detroit, Gale Research Co., 1975. 9 v.

- Vol. 1: *Environmental education.*
- Vol. 2: *Waste water management.*
- Vol. 3: *Environmental planning.*
- Vol. 4: *Environmental values.*
- Vol. 5: *Noise pollution.*
- Vol. 6: *Environmental law.*
- Vol. 7: *Environmental toxicology.*
- Vol. 8: *Environmental economics.*

Papua New Guinea. Department of Education. *Agriculture: the environment, teacher's guide, grades VII and VIII, Unit 2.* P.M.B., Boroko, 1980. 25 p. 614.707 PAP

Parker, Don H. and Donald W. Statler. *Ecology laboratory: teacher's instructional booklet.* Chicago, Science Research Association, c1966. 44 p. *(Learnings in science II)* 614.707 PAR

Perrott, Elizabeth. "Environmental education - key issues of the future role of the educator," *Habitat International* 4(1/2):199-206, 1979. P

Philippines. Office of the President. The Man and the Biosphere Inter-Agency Committee on Ecological Studies and the Environmental Center of the Philippines, Manila. *Ecosystems and environment; man and the biosphere.* National Media Production Center, 1975. 20 p. *(Inter-Agency Committee on Ecological Studies (MAB))* C.F.

"Pollution: the rape of the land, water and air," *Business Review* 9(3): 1316-1321, April 1981. P

Principles of environmental science, edited by Liu Peitong and Chen Yiqiu. Beijing, Shui Lee (Water Conservancy), 1981. 383 p. (In Chinese)

Raina, V.K. "Environmental education: issues and organization," *Journal of Indian Education* 6(1):19-24, July 1980.
P

"Research and development for environmental education curriculum," *Research Bulletin of the National Institute for Educational Research, Japan* (19):83-84, December 1980.
P

[Seminar on] Environmental Education and the Training for Engineers, 17-18 November 1980. *Final report of the Seminar organized by the Faculty of Engineering, Institute of Environmental Research, Chulalongkorn University under the sponsorship of the National Environmental Board of Thailand and Unesco.* Bangkok [Chulalongkorn University] 1980. 18 p. mimeo.
614.707 SEM

Seng Siok Hoon. "The place of conservation training in early cognitive development," *Singapore Journal of Education* 3(1):32-35, October 1980.
P

Sharma, D.V. "Environmental education for adult education functionaries," *Indian Journal of Adult Education* 41(3):3-6, March 1980.
P

Unesco/UNEP Intergovernmental Conference on Environmental Education, Tbilisi, 14-26 October 1977. *Major environmental problems in contemporary society.* Paris, Unesco, 1977. 16 p.
614.7 UNE

Vidart, Daniel. "Environmental education - theory and practice," *Journal of Indian Education* 6(2):35-51, July 1980.
P

Walker, John and Jim Mitchell. *Walmit divided* (Kit). Canberra, Curriculum Development Centre, 1980. (Environmental Education Project) Contents: 1. Map and streetscape of Walmit; 1 map (for reproduction purposes); 1 set of scenarios; 1 set of profiles; 1 instruction booklet, 2 posters.
K614.707 WAL

Ward, Di. *Streets*, artwork by Easter Kasepuu. Canberra, Curriculum Development Centre, 1980. 18 p. (Environmental Education Project)
614.707 WAR

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The publishing reference data for the quotation on the title page is: Thomas, Lewis. *The lives of a cell: notes of a biology watcher.* New York, The Viking Press, 1974.

Addendum to References for Australia

Gilpin, A. *The Australian environment—12 controversial issues, 1980.* Melbourne, Sun Books. (recently received)

Additional credits

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